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ALAIN VICTOR ITANGISHAKA

**TITLE: DESIGNING INTERACTIVE TECHNOLOGY TO MOTIVATE OVERWEIGHT PEOPLE TO LOSE
WEIGHT BY DOING PHYSICAL ACTIVITY.**

Master of Science thesis

Examiners : Dr Aino Ahtinen

Dr François Christophe

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ABSTRACT

ITANGISHAKA ALAIN VICTOR: DESIGNING INTERACTIVE TECHNOLOGY TO MOTIVATE OVERWEIGHT PEOPLE TO LOSE WEIGHT BY DOING PHYSICAL ACTIVITY.

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Nowadays, gaining inappropriate weight as being overweight has become a global issue. This problem was once only considered as a problem of rich people or for people from high-income countries, however, it is now affecting even low and middle-income countries particularly in the urban area. It is an issue that attracts the attention of many scientists and researchers. With the rapid advancement of technology, it is now widely used to contribute to finding solution to this problem. This thesis has as the main purpose to find the motivational needs of overweight people for doing physical activity and provide a prototype application with features to address those needs.

Different methods were used from research to the design of the prototype. The literature review on motivational technology that supports people for physical activity was used. It was then followed by observation and face to face interview with potential users of the prototype. All the data collected were analyzed to find out what can motivate the overweight people to do physical activity. The motivational aspects found from observation and interview revealed some similarities with motivational aspects in the review of existing technology used to support physical activities. According to the results found in the literature review of existing technologies and the results from the user study, the overweight people are highly motivated by the social aspects. The technological solution presented as a contribution in this thesis strongly focused on sociability between people as a way of supporting the overweight to do physical activities.

The User Centered Design (UCD) was used from the early phase as the design method. This method was chosen due to its flexibility. It puts the users at the center of the whole work from collecting data to the evaluation of the design. The design of the prototype started by creating various scenarios and storyboard. A mock-up prototype application was designed with different social motivational features to demonstrate the concept. The prototype was tested with the potential users in order to get feedbacks and suggestion on how it can be improved.

PREFACE

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I thank my family and friends for their support and love they expressed during this master programme. Without them, I wouldn't have reached the level I am today. I dedicate this thesis to my wife Girimana Christella, my father Muteragirana Barnabé and my mother Twagirayezu Marie Goretti for their unconditional love and sacrifice that they provided to support me in order to reach to this achievement. I would like to thank my siblings who have always been on my side to encourage me every time.

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SYMBOLES

UCD: User Centered Design

BMI: Body Mass Index

WMO: World Health Organization

TUT: Tampere University of Technology

UI: User Interface

PA: Physical activity

UED: User Environment Design

1.INTRODUCTION

This section describes the background and motivation of the research of this thesis, comprising the research problems and goals as well as the organization and the structure of the thesis.

1.1Definitions

a. Overweight

A person who is overweight is described as a person having inappropriate or a lot of weight relatively to his or her height. The Body Mass Index (BMI) is a measure used in the classification of people weight into different categories such as underweight, normal, overweight, obese, severely obese and morbidly obese. The BMI is defined as the weight in kilograms divided by the square of height in metres (kg/m^2) [1]. As represented in the figure 1.1, an individual is considered to have a normal weight with a BMI between 18.5 and 24.9 and he becomes overweight when his BMI is between 25 and 29.9 kg/m^2 . When reaching 30 kg/m^2 he attains the stage of being obese, and people who have a BMI which is lower than 18 kg/m^2 are considered as underweight .

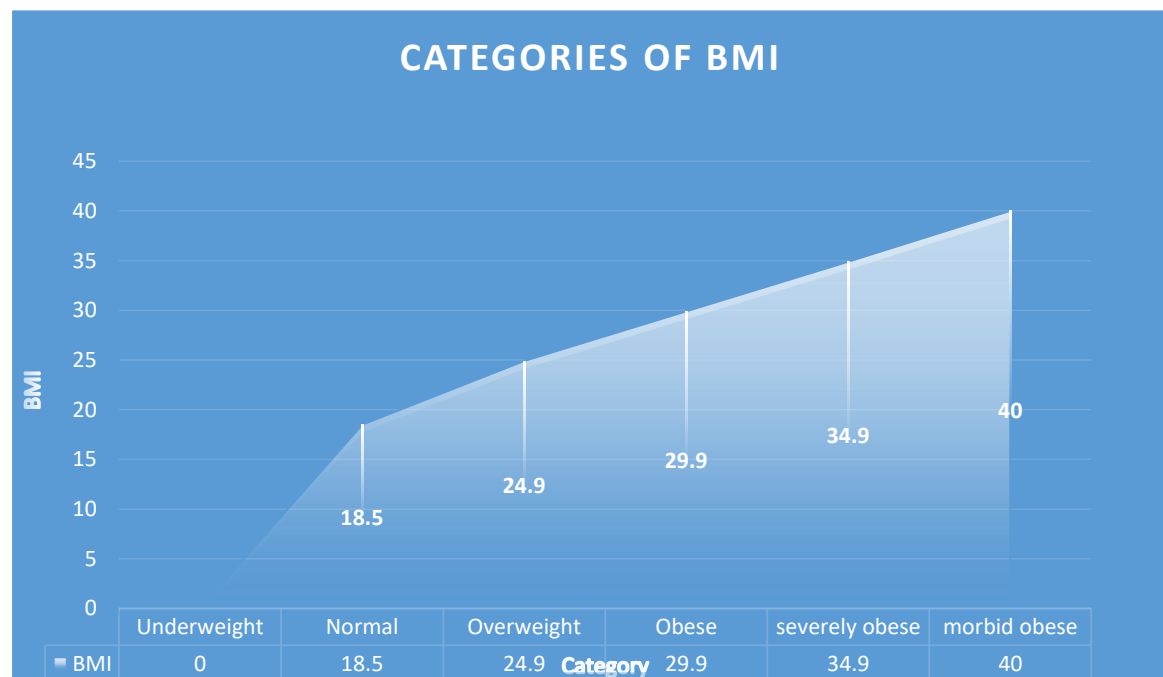


Figure 1.1: Different categories of BMI

b. Physical activity

WHO 2015 defines physical activity as: *“any body movement provided by the skeletal muscles that require energy expenditure”*, for example walking, playing, running, carrying out household chores [2]. The term "Physical activity" is different from "Physical exercise". Physical exercises are part of physical activities. Physical activities include physical exercises as well as other activities that lead to the body movement which can be performed while walking, working, dancing, playing. People can do physical activities in many ways and anywhere. It does not necessarily require them to find an appropriate place or any equipment for that. Physical activity can consist of carrying the baby, carry a heavy bag, playing with kids, cleaning, walking up stair than using elevator etc.

1.2 Background and motivation

a. Prevalence of overweight among people in different regions

The accumulation of inappropriate or a lot of weight has become one of the problems of the 21st century. The number of affected people has increased since 1980 especially in many high- income countries [1]. It is the source of several major risks of chronic diseases such as diabetes, cardiovascular disease, cancer, breathing difficulties, high cholesterol, and high blood pressure [1]. Many countries have spent a huge amount of money on health care cost because of this epidemic issue; for example, the total excess cost due to the prevalence of overweight in United States is estimated to 254 billion US dollars [3]. Furthermore, the US has spent 208 billion due to the decrease of productivity secondary to the premature morbidity and mortality and 46 billion were spent indirectly in the medical sector due to this issue [3].

The rate of overweight people varies differently between men and women and between different regions of the world. The smallest rate of overweight people seen in 1980 was in Vietnam with only 2.8% for men and 2.6% for women. The rate of overweight people was 50% for men in countries like Andorra, Islands, Czech Republic, Ireland, Lithuania, Malta, Samoa, Slovenia, and Tonga. Other regions with similar rate were South and Southeast Asia and Central and Eastern Africa. The highest rate was seen in 2008 in Nauru, a tiny island country in Micronesia with 93.6% of overweight men and 74.8% of overweight women [4].

By 1980, the regions with the highest rate, 50% overweight people for women include Eastern, Central, and Western Europe, the Caribbean, Oceania, North Africa, the Middle East, and Southern Africa. Ten years later more than 47 countries had the higher rate in this region, by 2000 the number increased to 74% [4]. The highest rate among male reached a peak in 2008 with over 90% of overweight people in Cook Islands, Nauru, and Tonga and over a half of the male population was overweight in 100 countries [4]. According to World Health Organization, the recent report revealed that 39% of the global adults population were overweight with a BMI ≥ 25 kg/m² in 2014 compared to only 24.4% in 1980 [2]. The highest number of overweight people was found in the United States with more than two third of its adult population approximately 68.8% of adults [4].

As presented in the figure 1.2, among the WHO Regions, the smallest rate of overweight people was seen in South East Asia where only 22.2% of people were overweight people in 2010 and only 19.8% in 2014 [3]. America and Europe counted respectively 59 % and 56.6% of overweight people in 2010 the rate raised 4 years later to 61.3% in America and 58.6% in Europe [3]. The Eastern Mediterranean had 44.5% of overweight people in 2010 that increased to 46.8% in 2014[3]. Africa also saw an increase in the number of overweight people to 33% in 2014 compared to 29.3% in 2010[3]. Different reports have shown that the women tend to be obese compared to men.

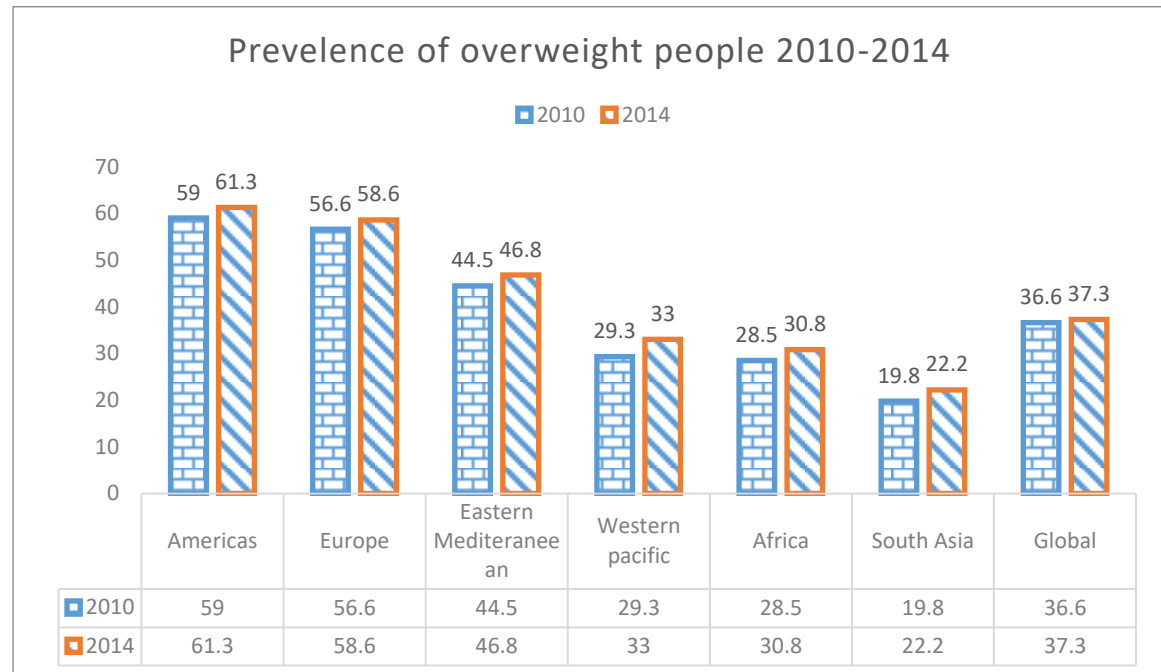


Figure 1.2 Prevalence of overweight population in different region between 2010 and 2014

This issue was once seen as a problem of only high income-countries, but now it is affecting also the low and middle-income countries, especially in urban areas. The number of overweight population that prevails in high-income countries was more than double of the rate that was in low and lower middle- income countries [3]. Worldwide the number of overweight people increased from 857 million in 1980 to approximately 2 billion in 2013[3].

As shown in the figure 1.3, the global proportion of overweight population kept rising, the percentage of overweight men went from 29.9 to 36.9% compared to 28.9% and 38% for the female between 1980 and 2013 [6]. The growth recorded varied from a region to another, the developed and developing countries saw a high raise. However, the rate was different in both sexes. In developed countries, the rate of overweight population was higher for men than it was for women while in developing countries a great number of overweight people was recorded in women population than men[6].

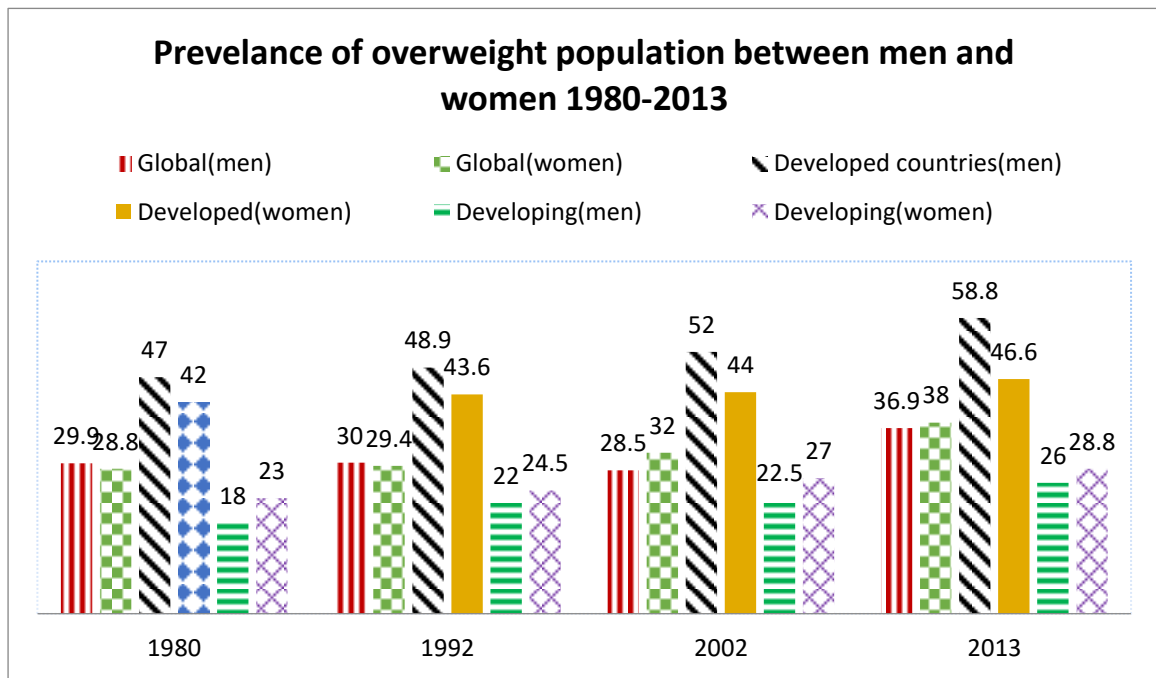


Figure 1.3: prevalence of overweight people by countries economic status, and sex between 1980-2013

As a student majoring in User Experience, with the knowledge acquired during my master programme. I am aware of the technological process and methods that can be used to help the overweight people to overcome the problems that they face. I have been in contact with many of them who have this issue including people who are close to me. I am aware of their challenges. I am motivated to add my contribution in finding a reliable technological solution that can help overweight people to lose weight by doing physical activities.

b. Prevalence of physical Inactivity among people in different regions

Physical inactivity has been identified as the fourth leading risk factor for global mortality with 6% of deaths [7]. The challenge for people can rise from sustaining a regular physical activity because of many reasons as lack of time, good environment, energy as well as keeping motivation up. Individuals with lack or insufficient of physical activities have more risk (20 to 30%) of death than people who are physically active [7]. Approximately 23% worldwide adults aged 18 and more were less active in 2010. The proportion of inactivity was lower for men than women, 20% of men were physically inactive compared to 27% of women [2].

The Figure 1.4 shows statistics of physical inactivity among adults according to the countries income. In high-income countries, approximately 27 % of males and 37% don't do enough physical activities compared to 12% of males and 24% of females in low and income countries [2]. In the upper-middle income countries, the prevalence of physical inactivity is 28% for women and 23% for men while in the lower-middle income countries only 14% of women and 19 % are physically inactive. Globally the highest rate of physical inactivity was seen in high-income countries with 32.7, following by the upper-middle income countries with 25% [2]. The decrease of physical activities among people is in part caused by inaction during the moment of leisure, sedentary behaviors at work or at home [2].

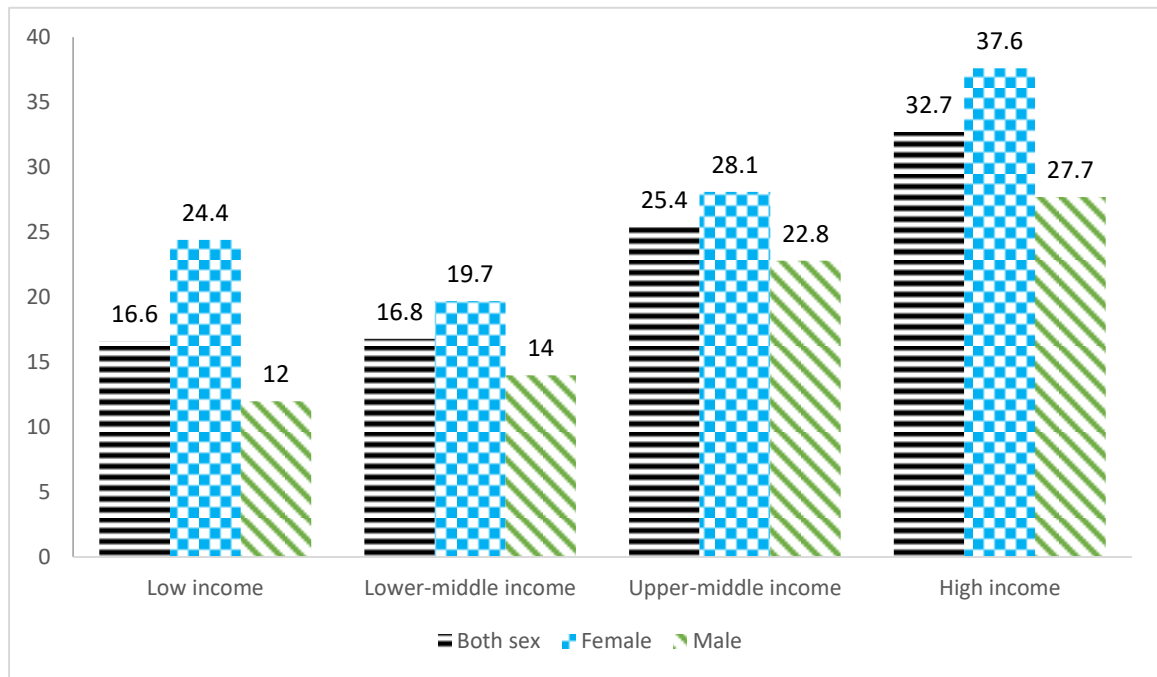


Figure 1.4: The prevalence of physical inactivity according the sex and income group

In WHO European region, 53 members have agreed to act in order to fight against this epidemic issue. They endorsed new physical activity strategy for WHO European region between 2016 to 2025 [8]. The main purpose of this strategy is to inspire government and stakeholders to take enough action by increasing the level of physical activities among people. These actions could consist of promoting physical activities, finding available places for physical activities that are attractive in a safe environment and accessible to the public. In addition, it includes ensuring equal opportunities for men and women regardless the age, income, education, disability or any other form of discrimination [8].

1.3 Research problem and goal

There are various factors that can cause a person to become overweight. This thesis emphasizes on the factors related to people whose being physically inactive that led them to become overweight. The aim of this project is to study and understand how technology can be used to sustain and increase the motivation of people with overweight for practicing physical activities. The target group is people in the range of 18 to 40 years old whose BMI is between 25 and 29.9 kg/m². The thesis studies the factors that can drive the target group for changing behaviors and adopt more and more an active lifestyle depending on physical activities.

The research questions of this thesis paper are:

1. What are the needs of overweight people that can help them to increase the motivation of physical activity?
2. What are the motivational features important for the new prototype solution?
3. What are the design strategies that can be adopted for the new prototype application design to help increasing physical exercise motivation?

To summarize, the first question emphasizes on the understanding of factors that can interest and motivate overweight people on doing physical activity. To answer this question, it requires research and analysis of the data and information collected from overweight people. Different data collection methods such as interview, observation are used to find those motivational aspects. The second and the third question explore the design strategies to follow in order to meet the needs and the requirements. The expected outcome of these two questions consists of designing a technological solution that can be utilized by overweight people for physical activity. My objective for helping overweight people to lose weight is to design an interactive prototype product with motivational features for physical activity.

1.4 Organization of this Thesis

This thesis is divided into eight chapters from the introduction to the discussion and conclusions. The second chapter provides a review of the work already done by researchers in order to find the suitable solution to this problem. It explains the factors that can motivate overweight people to increase physical activity. It reviews the existing technology used to boost the motivation for physical activities and the design requirements of application used to support physical activities.

The third chapter describes the design methods used, shows how the data were collected, analyzed as well as the explanation of all the design process and tools used. The design method described in this chapter consists of User Centered Design, all its phases are reviewed and the reason of its suitability to be used for this thesis. This chapter comprise two other sub chapter as data collection method and user-centered evaluation used for this thesis

The fourth and the fifth chapter concern the User Study. In this part, a description of the participant recruitment process is given. The detail of the characteristics of interviewees is explained. In addition, it describes methods and interview process used. Background of interview questions is given.

The fifth chapter contains the interview results. The results include the findings obtained from the interviews. It analyses the data collected from interviews. Moreover, it answers the first research question of this thesis.

The sixth chapter includes the design of the prototype. It comprises all the methods used in realizing the prototype. This chapter contains five sub chapter as brainstorming, persona, storyboarding and use case, user environment design and prototype. This chapter answers the second research question of the thesis.

Seventh chapter concerns the evaluation of the design and the use of the prototype. In this chapter, four different existing evaluation methods are reviewed and one of them was picked for the use of the design prototype for this thesis. It also includes the evaluation with the users that interacted with the prototype and evaluated it on the different scale. The answer to the third research question of this thesis is explained in this chapter .Last is the eighth chapter, which shows a summary of the results of the overall research. It provides a conclusion and suggestion to be taken into account for any future work.

2. LITERATURE REVIEW

This chapter aims to investigate the current situation of the overweight people issue. It reviews the existing technology and devices used to support people during their physical activity. It points out the suitable solutions to tackle this issue. In addition, it shows the motivational features of the current applications that can be used for the new solution to improve them.

2.1 Behavioral change

Changing behaviors by controlling the weight may require changing a lifestyle. Taking appropriate strategies are needed in order to lose or maintaining a good and comfortable weight. The change requires that overweight people create an environmental support, a healthy diet or regular physical activities. Creating an environment favorable for a weight loss may involve in finding a supportive community that can provide encouragement on weight loss during physical activities [9]. Overweight people can, for example, adopt good eating behavior such as eating fruit, vegetable, and grains and taking every day a regular time for physical activities (30 minutes cycling, running, walking) [9].

Moreover, overweight people can control their diet for example by checking the constitution of the food that they eat. They need to know the quantity of sugar foods and the amount of fat in the foods that they eat.

Motivation is considered as a way of supporting behavior change. The source of motivation depends on each individual mindset. Behavior change theories and model can be applied as the way of changing healthy life such as health belief model (Becker & Janz, 1984). It is important to adopt a lifestyle change as a priority when an individual wants to lose weight. The change has to preferably be a lifetime change. Overweight people has to draw a plan that can lead them to their goal, for example, set the date to begin, predict the change to be made on a future date. They need to know the diet and the type of physical activities that they have to do [9]. The decision may require many efforts and sacrifices that individual in question has to take into consideration.

According to WHO, people aged between 18 and 64 olds need to spend at least approximately 2h 30 minutes per week on a moderate physical activity otherwise they can spend weekly 1h15 minutes on vigorous intensity activity [2]. Doing a regular physical activity at a moderate intensity (walking, dancing, cycling, doing sport) can have a positive impact on individual health. At any age, being physically active is always good for people wellbeing. Some studies have shown that talking with patients about weight control help to promote behavior change [9]. Patients who are counseled in the primary care setting about the benefits of healthy eating and physical activity often took positive action [9]. Individuals who get advice session from the provider can easily change behavior on their eating habits and physical exercises than people who didn't get any advice. In order to help them to reach their goal, by advising them, health care providers should take into consideration the cultural difference about weight, diet, and type of physical exercises. Behavior change requires people to be aware of their health [9]. Encouraging and praising them can help overweight people to change their behaviors. While an overweight people is trying to lose weight, at each occasion friends meet him or her, noticing the progress they have made encourage them to stay motivated. Some of the overweight people might be discouraged of losing weight at a slow speed [9].

Behavior change requires that overweight people to identify and set a goal. They need to take action

according to the time and efforts that they have to take, for example losing approximately 25 kg in 3 months [9].

2.2 Motivational factors toward the use of mobile applications for physical exercises

Motivation is defined as the intrinsic determination in order to reach a specific goal [10]. It can also be defined as a psychological force needed to take an action (Maferima Touré-Tillery and Ayelet Fishbach) [11]. Motivation is a crucial aspect for many people to get courage and determination on doing regularly physical activities. Overweight people consider a physical exercise as a medical prescription; motivation could be needed to change it into enjoyable activity or an interesting hobby. Motivation factors can depend on many characteristics; it may differ from men and women, from age, social status, culture or weight.

According to Ahtinen 2015 [12] on motivational factors towards the use of mobile exercise application [12], a number of factors are considered as aspects supporting physical activities. Those factors include basic aspects that support people during physical exercises such as tracking and viewing own data, setting the goal, checking progress, acknowledging the achievement and getting the reward. In addition, other important factors seen were factors related to advising, social factors and factors of engagement.

During Ahtinen 2015 research [12], people have shown that being able to track and viewing own data were considered as one of the principal motivational factors that people appreciate when they are doing physical activities. The users are motivated by the fact that they can easily be able to check their speed, length, pressure etc. Tracking and viewing its own data are believed to be among the principal factors that are found in many software applications used during physical activity (Ahtinen 2015). The users appreciate the applications with options of tracking many exercises and that have many parameters (e.g length, route, heartrate, speed, calories etc). They prefer to have the possibility of saving their data so that they can check them later [12].

Acknowledgment and reward are among the elements that were seen to be attractive to the users. They were motivated by seeing the outcome of the efforts having an effect on them, for example, lose weight after two weeks of regular physical exercises. They were happy of getting encouragement, praise and other sorts of rewards [12]. The design was made in a way that it gives the feedbacks on the progress using sound, text another visual format. At every exercise, the user could get the summary of his or her progress. In addition, the reward is a motivational factor that could support users to keep on doing physical exercises. The users could get the new feature after reaching their targets. The users appreciated the ability to see the progress toward the goal [12]. The fact of setting their goal increases motivation, they can track their progress, which can push them to stay focused and determined. They were motivated also by getting the pieces of advice on how to proceed according to their own situation through training and coaching program.

According to the same studies (Ahtinen 2015) [12], factors motivating people on physical activities are multiple and depend on various aspects as the social factor (for example sharing, cooperation, and competition among users). In the human nature socializing one to another can push and encourage people for an action, for example, people can be interested in being together. People can be motivated

by doing same physical exercises in-group of friends. It can bring a sort of joy and fun to them. Participating as a group in same physical exercise push them in sharing their own experience, their success of failure stories, which strengthen them and let each individual believe that he or she is not alone.

An advisory factor was also found to be the source of attracting users and motivate them for doing physical activity. Advising the users was revealed as the motivational factor for physical exercises, users are interested in an application that can play the role of advising them [12]. People were concerned on knowing whether they were doing exercises in the right manner. Advising them would make them more confident in what they are doing. Furthermore, they expect that the application can take the role of reminding them the benefits of doing physical activities [12]. The users suggested that it is better for them to get the advice before exercises while exercising, and after the exercises. They also wanted to get the summaries of the results of their progress. It is clear that the users wanted the application to act as a human. The users suggested that the advice could change during the exercise according to how the user are proceeding it and get an update on the instruction of what to do. With that way it can provide them the right support in each step of the process [12].

Concerning predicting on their future, some of the users showed that they would be interested in the application that can tell them what will the results be in the future by doing a particular exercise [12]. They wished that the applications inform them on their progress. They wanted to be given the predictions on how their progress would be at each step of the process and get an estimation of the results in the future. In summary, they were interested in the fact that the application could help them to visualize the future before spending any effort on physical exercises.

The factor of engagement was revealed to increase motivation. Having variety of new things, more interacting and exciting new features and joyful and lively approach seemed to be among the users' motivational aspects for the application (Ahtinen 2015) [12]. The users wanted an application with more different features and functionalities that they can interact with. The study revealed that as long as the time goes on, new information and features of the application would motivate them more. In addition, users wanted regular updates on the features and the content and it was seen as an aspect that can push users to keep on a high motivation [12].

2.3 Measuring motivation of physical activities

The dimension of motivation refers to aspects related to the way of continuing the goal and aspects related to the benefits that can have resulted. There are two types of motivations that include intrinsic and extrinsic motivation. Intrinsic motivation refers to enjoyment and interest as results of the goal (Shah & Kruglanski 2000). With extrinsic motivations, people are interested in reward such as money, trophy at a sporting event [11]. Extrinsic motivation can result from social aspects, for example by wishing to honor reward, gift, and ourselves. It can be from the competition or performance results.

The measurement of the motivation of physical activities can be classified into four major dimensions (abbreviated as FITT) as Frequency of the activity, mainly measured weekly; Intensity carried out during the activity, Time duration of the activity and Type of activity [11]. Motivation might not be seen directly, it requires a sequence of observation over a time period, viewing and comparing the change of behavior toward an action or task. Measuring motivation consist of cognitive observation such as recall, perception, evaluation, effectiveness (e.g experience), behavior (Maferima Touré-Tillery and Ayelet Fishbach). [11]

Measuring motivation can also depend on the comparison between previous subsequent behavior toward an action (for example an individual exercising can be more motivated by doing exercise if he or she can get a reward). This can be seen on how he or she can increase the speed and the commitment to doing the exercise. An individual who is exercising for fun or with no specific reason can be less motivated than an individual exercising for a specified goal (for example goal of having a healthy weight) [11].

The performance made to the goal is another factor that can be used to measure the level of motivation. It's crucial to know what kind of motivation it is all about and its dimensions. The dimension of motivation can be observed through the process and outcome to achieve an action goal. It can also be observed on the speed used to complete the goal. A low speed to complete a task can describe how less an individual is motivated while a high level of motivation can be seen through a high speed of achieving a task. This dimension results from external profits such as rewards or acknowledgment. It is related to the outcome or achievement of the target goal [11]

Moreover, motivation can be shown on how easily an individual can be committed to perform an action. The more the motivation to accomplish a task is high, the more the person's commitment is high [11]. The process-focused motivation is described as a form of motivation that leads an individual to continue to the goal.

The choice is a term meaning evaluation and selecting between more than one object. A choice can be seen as a measure of motivation. An individual can choose to take a holiday and go in Spain for a short term Spanish studies rather than visiting the Egyptian pyramids. People can conclude that he was more motivated by learning Spanish. Importance was given to one of the choices due to a specific goal to achieve [11]. The interest given to our choice can also direct us to determine how strong the motivation is, for example in a number of similar objects such love movies, select several movies can be observed as a sign of strong the motivation toward the type those movies.

2.4 Persuasive technology in applications supporting physical activity

In order to be physically active, a behavior change is required. With a high rapid of advancement of technology and computer, persuasive technology is being more and more effective to increase motivation for physical activity. This type of technology involves in tools such as pedometer, media as audio and video as well as social interaction to convince people to change without being aware of it. Sunny Consolvo et al [13] has shown that persuasive technology, through goal setting can play a considerable role in people behavior change. Persuasive technology can support overweight people in adopting a new lifestyle. Persuasive technology is known as an interactive technology such as computer system, device application that consists of supporting people in changing attitudes or adopting a behavior change (Fogg 2003) [14]. Persuasive technology has been used to assist people during their physical activities. Fogg said that the persuasive technology can help in changing behavior especially in non-commercial areas, for example in the area of preventive healthcare and fitness [14]. Persuasive technology is the most reliable tools to be used for changing people's behaviors and attitudes through visual or audio aspect. The persuasive technology can lead users to a behavior change through a visually simulated experience and facilitate them to follow and realize other's people performance.

From the past three decades, technology has been used as one of the solutions to address the problem of overweight people. It attracts much more attention of the researcher, industry and business area. Nowadays we have several devices and software applications that are being used in improving people's wellness, fitness and health care in general. Technology is widely used in supporting people for doing physical activity. It is even more used especially for people as overweight who do the physical activity not for fun but for a well-defined purpose. They need to know and collect the exact information about their weight, fitness or wellness, and track how far they progress. Industries and researchers have made several software applications that are used while doing physical exercises, wellness, and health fitness.

Motivation can be classified in two categories that consist of intrinsic and extrinsic (Darin et al, 2015). Intrinsic motivation involves in receiving reward or another benefit for example as having fun with friends. Extrinsic motivation consists of an external profit or reward as a trophy from competition. Persuasive technology is one of the strategies that have been used in fitness application. By definition, Persuasive Technology is an interactive technology that consists of changing people's attitudes (Fogg 2003). Doing a regular physical activity as routine is hard for the majority of people (Haskell et al., 2007). The framework of interactive technology has three basic ways of persuading users, first as tools, second as media, third as social actors. As tools, they make easy the activities, lead users on the process, as media and through simulated experience they can change behavior and attitude and as the social actor, they persuade users through social factors. Persuasive technology is performed in various area including advertising, healthcare game etc. It has especially been used to encourage good eating behavior (Intille et al. 2003).

The elements that promote physical exercises count self-efficacy, positive results expectation, effective self-regulation and support social facilitation. Using technological system in health care has emerged in the past years, many software applications and devices are used to support physical activities. They can help users, for example, to count the steps and measure how many they have done along the day. Many of mobile phone are made with an incorporation of application to track and share progress with other people and estimate the necessary work or energy needed to reach to goal.

2.5 Analysis of motivational features of the reviewed applications

The choice of the features to be used in the new prototype application refers to the motivational factors described in the literature review of this thesis in the section 2.2 “*Motivational factors toward the use of mobile application for physical exercises*” and the section 2.3 “*measuring the motivation for physical activities*” as well as the researcher’s own opinion. Motivational factors described in the sections 2.2 and 2.3 were analyzed in this section for the existing application and considered to be used in the news prototype application.

Sunny Consolvo et al, 2006, revealed that the factor of **social influence** as motivational aspect for physical activity. The social influence described in that paper involves in sharing data and progress on activity between people. Sharing information was described as creating a sort of pressure and encouragement on people to increase their physical exercise [15]. According to the research of Sunny Consolvo et al, 2006, people can be motivated by doing physical exercises by being aware of the activity” **level performance**”. This factor refers to the knowing performance according to the setting the goal set. **Setting the goal and following his or her performance** to that goal are factors encouraging for doing physical exercises [16]. Moreover as explained in section 2.2 of this thesis, these features were also revealed by Ahtinen (2015) in “*Mobile Application to Support Physical Exercises-Motivational Factors and Design Strategies*”. **Goal setting and tracking progress** were shown as the factors of the basic support for physical exercises (Ahtinen 2015) as they allow people to set the goal and view the effect of their efforts over the time. In addition, motivation resulted from the **acknowledgement and reward** refers to the fact of seeing the effects of people’s workout or positive outcome. The Table2.1, gives a short summary of the motivational factors described above and reviewed in section 2.2 found in some of existing applications.

Applications Features	RunKeeper	Sportstracker	Fitbit	Fatsecret	Electronic pedometer	MyFitnessPal	FITAPP	S Health	Runtastic	MapMyRun	MapMyWalk	SenseMe
Share record	x	x	x	x	x	x	x	x			x	x
Track and viewing	x	x	x		x		x					
Professional trainer	x			x					x			
Set Challenges	x		x					x		x	x	
Acknowledgement and reward	x		x						x	x	x	
Goal setting	x	x	x			x	x			x	x	x
Community				x		x						

Table 2.1: Classification of feature found in existing application

According to the table 2.1, the most popular feature in the applications reviewed is “Share record”, ten out of twelve applications have this features. Tracking and viewing feature was found in five applications as Runkeeper, Sportstracker, Fitbit, Electronic Pedometer and FITAPP. Tracking, viewing, and sharing records are the motivational factors that aim to support during physical exercises (Ahtinen2015). Eight of the applications have feature related to “Goal Setting” which is the second most popular features among the applications reviewed. Rewarding features and Set challenges features were both found in five applications. “Community” was found in two application as Fatsecret and MyFitnessPal. “Professional trainer” feature in three of the applications refer to the social support aspects and through them, people can get advice from trainer and encouragement from friends. The features analyzed in the existing application can be useful for the design of the new prototype application.

Moreover, the applications reviewed can be grouped into two categories according to their features. The first category are for the applications that were designed for the aim of only tracking workout during physical exercises. Considering the application reviewed in table 2.1, the first category of tracking workout app are made by Sportstracker, Electronic pedometer, Runtastic.

The second categories are the made by the applications used to track people’s wellbeing, diet, weight and follow their lifestyle. Those applications aim to help people to be fit for example having desired healthy and active lifestyle through fitness advice and recommendation and diet plan. They can motivate people by providing them a personalized routine, competition between friends, and rewarding. The applications to be placed in this category are Runkeeper, Fatsecret, FitBit, MyFitnessPal, and SenseMe.

Both categories present applications with motivational features as described above in this section. However, in the opinion of the researcher, these applications need to be improved. Some applications account a number of missing features that can help to increase motivation. The missed features consist of “Plan for an activity with friends”, “Find partner or trainer”, “find sports location”. None of all the applications reviewed possess those features, which can help to enhance social support among people. These features can promote an easy interaction and friendship.

3. DESIGN AND DATA COLLECTION METHODS USED IN THIS THESIS

This chapter first describes four principle phases of the User Centered Design (UCD), which is the design method used in this thesis; it secondly explain the reason of its suitability. It also includes an explanation of the method and techniques used in collecting data as well as design tools used for the prototype.

3.1 User Centered Design Method

User-centered design (UCD) also known as Human Centered Design process (ISO 13407) is the design method chosen to be used for this thesis. The main advantage of this method is that the user is put at the center of the whole development process. This method presents the flexibility and effectiveness in conducting the work from the early stage of collecting data to the stage of releasing the final product. The UCD process has four essential parts including understanding the context of use, specifying the

user requirement, producing the design solution and evaluation of the design against the requirements (figure 3.1)[17]. The design of a motivational application as the solution for overweight people to be more physical active requires a good understanding of the potential users. The designer needs to observe and records the problems they meet on doing physical activities and interview them. Their needs and wishes must be taken into consideration as a priority when designing the product solution to target them. An interactive prototype solution is made and get tested by the target users to ensure that the usability goals are met.

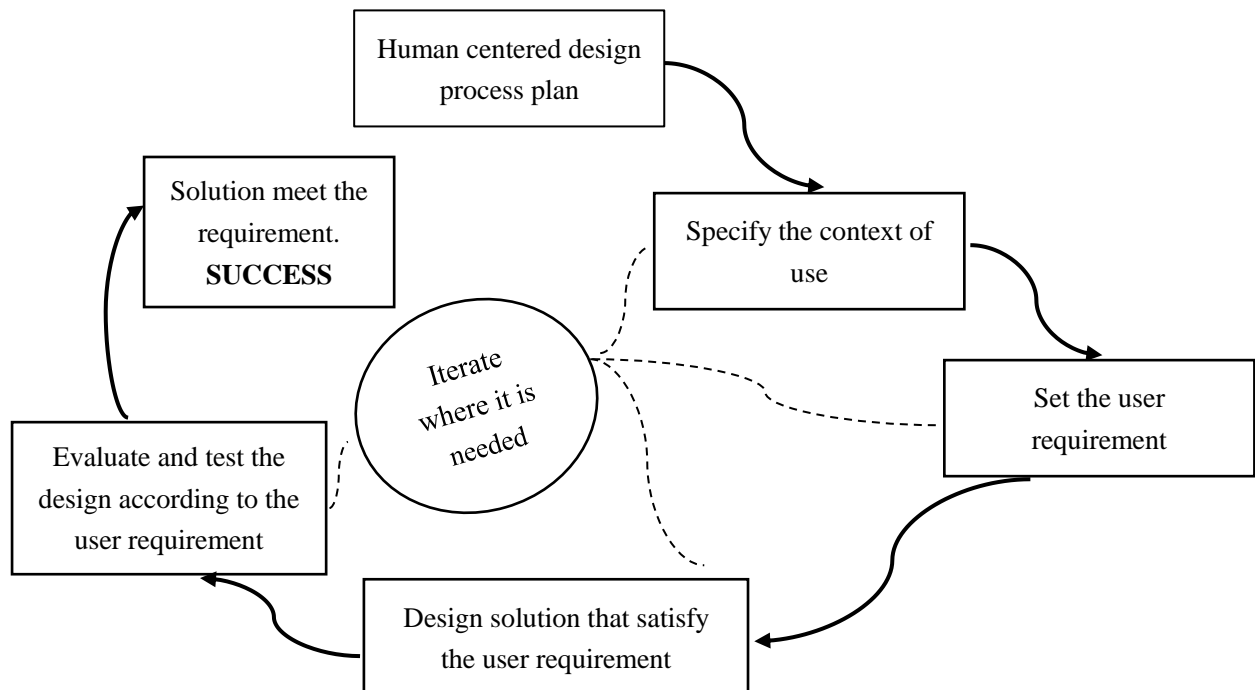


Figure 3.1: User Centered Design process

The four main parts of the User Centered Design have some other subparts comprising the usability methods, technics, design analysis, findings and test design (ISO 13407 1999). Those subparts depend on the objective of the design and the availability of the resources. The UCD process starts from the user's needs to the user's satisfaction. The User Centered Design process allows an easy use of the product or system. According to ISO 9241-210 standard [19], the design work is mainly centered on the user needs and understanding of context, task, and environments. The users actively participate in the design process and development. Compared to other methods, the UCD gives more consideration to the users and put them at the center of the work during the whole process of design. ISO 9241-210 standard provides a high level of design principle which includes and emphasizes on the UCD method and the iteration during the design process [19].

The activities that have to be done during the UCD are as follow:

1.Early study and continual of user tasks: at this stage, the user needs are identified, the challenges they face in their daily activities and the current methods and tools used to solve them. Designer understands the user behavior as well as their attitudes toward the task and the context they are expected to perform their activities

2.Assessing the user behavior, this is the stage where a basic prototype is designed and followed assessment the user's performance and reaction while interacting with it. Observation of how they interact with the prototype is analyzed.

3.Design and iteration, after evaluation and test user has been done, all the problems found are subject of being redesigned. It's a cycle of design and redesign after each user assessment until the design goal is achieved.

The User-centered design is the reliable method for the reason that the design consists of creating what user needs not what the designer think the user need and both designer and user work in pair. Even though the design follows the users' needs and suggestions, however, it can present some challenges (Kujala 2003). The problems of communication can occur between users and the designer and various objectives between the stakeholders that concerned by the design.

It is essential to study and know the way the users can be considered during the design process. There some other external aspects that have to be considered during the design. Those aspects consist of expectations of peoples who can be affected in a way or another by the use of the product and services [16]. Users can be classified into three different types of users which include primary, secondary, and tertiary users (Eason1987). The primary users consist of those people who directly use the artifact, secondary users occasionally interact with the artifact or use it through intermediate while tertiary users are those who can be affected by the use of the product. Not each one whose the product can affect has to actively participate during the design process but the effect of the product on everyone have to be considered (Preece, et. al, 2002).

Another major advantage of using UCD is that this method provides a good description and understanding of the psychological, organizational and social ergonomic aspect that influence the users while interacting with the computer [16]. Considering the user as one of the stakeholders during the design process assure that the product solution will meet the users' needs and suitable for its intended goal. The UCD method was chosen to be used in this thesis because its facilities to get the satisfaction of the users and high level of adoptions of the product solution [17].

3.2 Data collection method used in this thesis

Data collection step has to be done in the early phase of User Centered Design. Collecting the users information is not always easy. The big challenge is to know what type of data that could be useful during the design then choose the method to utilize to collect them. The aim of collecting data is to find out the problems and opinions of the target user prior the design step. In this thesis, the methods used to collect data include observation, interview, and brainstorming.

3.2.1 Observation

Observation was one of the methods used for collecting data. Through observation, the designer can get to understand the problem of the user, the context, the task, the goal. The designer needs to watch them and records or write a note of each event of the users and behavior. Generally, it might be complex for people to explain or describe exactly all their needs when you ask them even if they know them. For that reason, observing them can be effective to record useful information on the potential users as it avoids the problem of communication. The best way to gather the right data is to conduct both observation and interviews. The observation in the context of use helps the understand the activities, the users, and the environments.

3.2.2 Interviews

An interview is a way of gathering data through a discussion with the target users of the application. It was conducted in the early phase of the work and emphasized more on the subjects related to motivational needs and the use of application during physical exercises. The questions used during the interviews were the same and prepared in advance. Before the beginning of each interview, a consent with the participant was agreed. The participants also had the right to accept or stop even in the middle of the interview. The interview is the most used way of collecting data in Human Computer Interaction research and they are conducted at the beginning of UCD. In this thesis, the interviews helped to gather the detailed opinion of the potential users and the use of the existing applications, for example, the users need, experience, behavior, challenge and perception (Lazar et al. 2010).

3.2.3 user-centered evaluation

The design work was followed by the user-centered evaluation to test the usability evaluation. The usability is defined as *"the extent to which a system can be used by specific users to achieve specific goals with effectiveness, efficiency, and satisfaction in a specified context of use"* (ISO 9241-210) [19]. This part helps to improve the product design based on user feedbacks. It avoids the risks of designing a product that does not meet the user's requirements and needs. During the design, there might be so many requirements that are hidden or not easy to see unless the user-centered evaluation is conducted. The evaluation is made with the real users of the system. The feedbacks provide input for the iteration for further development. The challenge in human-centered design (HCD) is that it is not easy to imagine and specify what the users feel until you interact with them and they test the product that is targeted to them.

4. USER STUDY

This section shows how the participants to the interviews were recruited and it includes the profile of each participant. The explanation of how interviews were carried out and the methods used is described in this section as well as the idea behind the interviews questions.

4.1 Recruitment and Participants

The recruitments of participants targeted overweight people who are completely inactive or less active on doing physical exercises. The interviews were done in two phases, however, in both phases the characteristics of participants considered were similar. The recruitment of seven participants in the first interview phase was mainly targeted the university students living in the same social community. The factor of the social community of the participants was considered because of social interaction. In the opinion of the researcher, social factors can play a role on how people can be motivated to do physical exercises. The people having the same occupation and living in the same area tend to develop friendship and social interaction than people who live in an area where they do not have any common aspects such as occupation, age, etc. Indeed sports facility and social interaction can drive people to be physically active. The second phase of the interview included five participants were considered with the similar characteristics with the one in the first phase. This phase of the interview was conducted in order to collect more data from potential target users. In the second phase, except two participants

who were students the remaining were all workers. All the participants were recruited based mainly on their BMI, age, and physical activity level as it is shown in the tables below.

First phase of interviews

Interviewee	Gender	Age	Weight(Kg)	Height(cm)	BMI	Occupation	Activity level
Participant 1	Female	21	64	155	26.63	Student	occasionally
Participant 2	Male	29	86	173	28.73	Student	1/week
Participant 3	Male	29	69	165	25.34	Student	Never
Participant 4	Male	25	86	177	27.45	Student	occasionally
Participant 5	Female	24	67	158	26.8	student	never
Participant 6	Male	32	80	174	26.42	Student	3times/week
Participant7	Female	31	69	163	25.97	Nurse	Never

Table 4.1 Background and information of participants

The characteristics of participant shown in the table include four men and three female. The six interviews were conducted separately and all the interviewees were students. As shown in table 4.1 the youngest participant had 21 years old and the oldest 32. The BMI of participants ranges between 25.34 which the lowest and 28.73. The physical activity level of the participants was from “never” or “no” to three times in a week. Two of the participants never do any physical exercises while two others occasionally do. One participant was less physically active who does physical exercises once a week and other participant had a level of three times a weeks.

Second phase of interviews

Participants	Gender	Age	Weight(kg)	Height(c m)	BMI	Occupation	Description
Participant8	Male	37	72	166	26.12	Instructor	2/weeks
Participant 9	Male	32	89	169	28.71	Graduated student	1/month
Participant 10	Male	30	74	171	25.3	Worker	Never
Participant 11	Female	27	71	161	27.3	Worker	Never
Participant 12	Male	25	87	176	28.08	Student	Not sure

Table 4.2 Background and information of participants

The second phase of interviews (Table 4.2) was conducted with four men and one woman and the youngest among them had 25 years old while the oldest was 37 years olds. Their BMI range between 25.3 and 28.8. Two of the participants were students and the remaining were the public servant or workers. Four of them never do physical exercises and the remaining revealed to do physical exercises once a week and once a month for the other. All the participants didn't have any particular time for physical exercise. Many of them stated that even if they know physical exercises is important, however, it is not part of their life agenda. Most of them do physical exercises occasionally or in some circumstance.

4.2 Methods and Interview process

Participants had a series of questions classified in three categories including questions related to user physical activity, the dietary and user's current technology and devices used during their physical exercises. The outline of interview questions is available in Appendix A. At the beginning of each interview, all the participants were given a wide description of the topic, they were told approximate duration of the interview. The participants were assured that their identities and feedbacks would be reported anonymously. Before they sign a consent form (APPENDIX B) to approve the participation, everyone was given a moment to ask questions related to the interview. The consent form mentioned the purpose of the research, the rights of interviewees, the approval to be audio recorded and all information about their privacy. The participants were asked to provide their information about their identity, age, weight height and occupation. Many of them did not know the BMI category that they belong to. Their BMI was calculated by the researcher by using the weight in kg and square meter of the height (Kg/m²) as defined in section 1.1 of this thesis.

4.3 Background of interview questions

The interview questions were divided into three main parts concerning physical activity, dietary and applications used during physical exercises. The main part of questions concerning the physical activity aims to understand the general opinion of overweight people gives to physical activity in their life. In this part, interviewees were asked to describe how they do physical activity and explain the problem that they face about doing physical exercises. To understand the challenge they face, one has to describe his or her frequency on doing physical exercises in term of time for example never, every week, every month etc. Furthermore, they were asked about the level of their motivation in order to get a general idea of what can motivate them to do physical exercises and get to understand how they can keep up their motivation. The target group of participants as they were in the same age range, each one was also questioned on the main fitness goals he has and the plan to get them. This question can give an insight of how they can get help to reach their goal.

The second part of questions was related to the nutrition , this part aims to understand their eating habit , how they plan their calories intake compared to the amount of exercises they do. The last part of question refers to the use of mobile application during the physical exercises. Participants were asked about whether they use device or tool while doing physical exercises.

5. INTERVIEWS RESULTS

This section reveals the outcome of interviews done conducted with the participants. It analyzes the data from the interviews and answers the first research questions of this thesis "***What are the needs of overweight people that can help them to increase the motivation of physical activity?***"

The results of this section were utilized for designing the prototype application that corresponds to those results.

○ Interviews results and analysis of needs of overweight people

The findings showed that there similarities between the missing features described in section 2.5 of this thesis and the outcome of the interviews. The interviews revealed that existing applications need an improvement in order to support overweight people to increase their motivation on physical

exercises. The main motivational factors that resulted from interviews include social influence needs, good physical exercises environment, physical activity schedule and professional trainer. These factors are revealed below.

1. Companionship (Social influence)

The background of interviews with participants shows that many of the participants' lack of motivation of doing physical exercises are due to the lack of social support. According to participants, social interaction strongly correlates with their level of physical activity (PA) involvement. The participants suggested the need of friends, colleague or a particular community to boost their motivation during their moment of exercises. PA is likely to be a moment that they enjoy when they are together with their friends or other people. Interestingly, togetherness can push them to keep up their PA routine. Being with friends during PA can increase the time one can spend on doing exercises. For example, one participant said that when he is at the gym the moment that he can spend on exercises depend on the people he meets at the gym. He mostly stays for longer when he is with friends or other people around than exercising alone. The majority of interviewees confirmed that companionship motivate them for doing physical exercises.

"Meeting other people at the gym can make me stay longer than finding myself alone" (P9, Male 32, Male, BMI 28.71)

"It seems weird to me to come at the gym and exercise alone, coming with friends can motivate me" (P1, Female 21, BMI 26.63)

Friends are the good motivators when someone wants to reach the goal; encouragement from them can push them to get their goal of losing weight. One interviewee admitted that friends could help in reaching her goal. As she has wishes of getting the old body shape that she had before giving birth. Another participant revealed that admiration from friends or other people motivates him on doing his PA.

"I can get good motivation for physical exercise by having a companion with me during my exercises, friends can push me to get my goal for example if I am with someone who performs better than I do" (P7, Female 31, BMI25.97)

"I feel motivated when I have someone to go with me like a friend, also when I am ready to go somewhere someone might admire me" (P9, 32, Male, BMI 28.71)

"If I have someone like exercise partner, he would need a call or message me I would be motivated more" (P9, 32, Male, BMI 28.71)

"I feel more comfortable with friends when I am doing physical exercises" (P11, Female 27, BMI27.3)

"I do my physical exercises mostly alone at the gym but sometime I feel that I would change and go with a companion for a long distance run" (P2, Male 29, BMI 28.73)

"Friends can push me to do more exercises when they are making fun of me I can feel frustrated but I would consider doing more exercise" (P2, Male 29, BMI 28.73)

"It could be better for me if I can relax and exercises in a group with other people as friends" (P12, Female 24, BMI 26.8)

"Doing physical exercises with friends especially If I am doing something as a team sport would be better" (P4, Male, 25, BMI 27.4)

"I prefer to do physical exercises in a group maybe two or three people than alone for a sort of competition for example if one does ten pushups, I try to do more " (P3, 29 BMI 25.34)

Participant showed a desire of being surrounded by a community of people they are familiar with such as friends, colleagues, or classmates. They likely to enjoy a collective PA with their friends. Overall, the information collected from interviews support the fact of understanding the social context is associated with the level or the frequency of physical activity among overweight people. The interview results emphasized on the social support (friends, colleagues, community) as the way of pushing people to physically exercise..

2. Schedule or plan time for sport event

One of the biggest barriers for doing physical exercises that many participants expressed was "Lack of time" and difficulty in organizing sports event with friends due to other daily life activities such as jobs, school, family responsibilities etc. The "Lack of time" could be associated with the lack of motivation as all participants reported their wishes of being able to include physical exercises in their life. The need of exercises partner such as family, friends or colleagues requires both parties the time availability to go for same exercises and support each other. The management of time is an important factor that can help people to accomplish certain activities. Many participants refer their physical inactivity to the lack of time.

"Another reason is the time factor and I also feel general laziness every human being might have about doing things". (P9, 32, Male, BMI 28.71)

The participants interviewed revealed the importance of organizing sports event or competition. They showed that participating in competition can be an enjoyable moment and can motivate them to do physical exercise.

"Many of my friends are mostly busy, to agree on time I contact them by texting them on Facebook" (P6, Female, 24, BMI 27.81)

"Organizing competition can be more fun for me when I am competing with friends" (P11, Female 27, BMI 27.3)

"Doing physical exercises and competing with friends is a way of having fun for me "(P4, Male, 25,

BMI27.4)

The problem of planning event for physical exercises can be improved by helping the user to schedule sports activity with their friends and other people.

3. Sport facilities

Participants indicated that having a good physical environment contributes to their physical activity (PA) behavior change. The information collected from interviewees shows that easy access to exercises facilities increases the level physical exercises among overweight people. Sports facility was described by many participants a factor of motivation .Some participants noticed that lack of sports facility in their home residence was one of the reasons that contributed in leading them to be physically inactive. The participants revealed that the availability of the sports facilities was associated with their motivation or the frequency of PA. One can conclude that changing behavior to be more physically active can involve in promoting an environment for physical exercises.

“ Before moving out of Mikontalo (students dormitory) ,since there was a free gym right in our building I used to go there, now I don’t come as much as I use to do because I have to walk away from my home” (P10, Male 30, BMI25.3)

The participants expressed that a neighborhood sports facility has an impact on motivating them to maintain the exercises routine or push them to become physically active. This demonstrates that the proximity to an exercises location can further increase the level of adherence on physical exercises among participants. The more they can be near a good sports environment the more they can be motivated to exercise.

”My favorite sport is swimming and volley ball, once in while I go to swim, having a swimming pool nearby me, can push me to go more” (P6, Female, 24, BMI27.81)

” The gym is not in our building, I don’t always have the motivation to get ready and go to another place” (P9, 32, Male, BMI 28.71)

“I wanted to go to run and it started to rain, but because of the bad weather condition there is today I couldn’t go”. (P1, Female 21, BMI 26.63)

“ If gym is near my place it would be more easier for me to regularly come, maybe I will wake up in the morning and come but if it is far I feel a bit lazy to come at the university gym, I can do it only when I am there” (P2, Male 29, BMI 28.73)

“If had a good environment for sport it would push me to exercise more” (P4, Male, 25, BMI27.4)

By considering the background information from the user study, the main obstacles from physical environment comprise weather condition, the distance between people’s location to the exercises location. The availability of sports facilities can further increase people motivation for physical

exercises. Providing information about possible sports facilities and environment could address this need.

4. Professional trainer

The participants expressed the need of guidance, they said that it would be great to get a professional trainer who can follow and advise them on their exercises and progress. One participant met at the gym had a laptop that he had put it in front of him to a series of videos of known trainers. He said that he normally comes regularly at the gym but it often happens that he loses the motivation because he realizes that there is no improvement. The constant is that some of the participants interviewed used some application to coach them on the way they can do exercises.

“It would be helpful for me to have a trainer to provide me a structure and guide me to attain the physical condition I wish” (P9, 32, Male, BMI 28.71)

Having a professional trainer such as exercise leader can have a high impact on increasing the motivation of participant for doing physical exercises. Exercises leaders, as they are perceived to master how to train people can positively influence overweight people to increase the frequency of their exercises. The trainers are considered as the role model for many of the people in need of them.

“There is something harmful that we do by ignorance, I would be happy to get a professional that can help me to get a good body shape for example by giving advises and a schedule of exercises to follow” (P7, Female 31, BMI25.97)

“Professional trainer would be good as you know you are not wasting time doing unnecessary exercises, they can advise me on exercises that can impact my physical” (P2, Male 29, BMI 28.73)

“It could be better to get someone who can guide me especially if I am in a wrong way” (P12, Female24, BMI 26.8)

“The last time I went to gym was last year, I was with a friend and I was just following what he was doing ,a professional trainer would be like teacher for me” (P3,29 BMI 25,34)

With good exercises guidance and advises, it can be easy for overweight people to be aware of how to control their weight by increasing the level of their physical exercises. Trainers can help them to boost the motivation and build the confidence and encouragement toward their goal. The only concern expressed by all the users was that a professional trainer could be expensive to afford.

6. DESIGNING AND PROTOTYPING

This section describes the whole process of prototype design. It contains five parts, firstly the description of the brainstorming session and its outcome, secondly persona corresponding to the potential users of the prototype, thirdly the scenario and story board to explain the circumstance in which the prototype can be used, and the fourth part shows the architecture of the prototype. The last part concern the prototype design, it reveals different features of prototype and answers the second research question of this thesis ***“What are the motivational features important for the new prototype solution designed for overweight people?”*** The last part combines the newly designed features and motivational features found in the existing application (Section2.5)

6.1 Brainstorming

The brainstorming session was realized with four people, the researcher of this thesis included and led the session. Two of the participants were student had an IT background and the one was a master student majoring in business management with knowledge in IT. The debate method was used to increase the number of ideas about the solution that can be used to tackle the challenge of gaining weight. The table below summarizes the data of participants during the brainstorming session.

Participant	Age	Occupation
Participant 1	31	Master student in UX at TUT and former research assistant in IT department
Participant 2	29	Master student IT for health and biology
Participant 3	25	Master student in Business management

Table 6.1: Summary of the characteristics of the brainstorming participants

The debate made during the brainstorming was focused on different topics. The participants discussed on two topics:

- The reasons and circumstances that can drive people to lose motivation or to be physically inactive
- The possible solution to tackle the issue of losing motivation on physical exercise

Before starting the session, the researcher of this thesis explained to the participants its purpose and gave them a description of the topic. The process started by defining the goal and stating the problem to ensure that all participants understand the main issue of the topic. This was followed by individual's ideation where each participant had to write ideas on sticky notes provided by the researcher. This had as purpose to generate a wide range of individual ideas. The generation of individual ideas took about ten minutes on each topic. After individual generation of ideas, the participants had to share the content of those ideas and similar ideas were grouped together. Each idea was discussed among participants and agreed on what group it belongs to. After grouping of all ideas, the participants had a further discussion to see them and how these categories can fit the goal of the addressed topic.

The results of the brainstorming pointed out seven issues that can push people to lose motivation

- Laziness
- Bad weather
- Afraid to do not reach the goal
- Lack of time
- Ashamed of own body shape
- No exercises partner
- Bad eating habit

The second topic that was discussed during the brainstorming partly depends on the outcome of the first topic. On this second topic with participants, we focused on thinking what concept could be suitable to solve the issues of losing motivation. After discussion among participants, we come out with three following concepts:

- Social sport application where people which can help people to do physical exercise by having fun at the same time.
- Physical exercises application with robot guidance.
- Gamified fitness and nutrition application.

After analysis of the three possible solutions proposed on this brainstorming, the solution retained was to design a fitness application that possesses social features such as a feature that enhance the interaction among people and features that help users to create friendship through sports activities. The aim of this application was to create a sort of community friendship and fun while exercising. The new prototype application was then named "Social sports app".

6.2 Persona

After analysis of all the data gathered during interviews and observation, two different type of persona corresponding to the potential user of the application were created. The two personas represent the profile of most of the participants of the interviews. The user's needs and goals found in those personas resulted from information gathered from the user study. The figure 6.1 and the Figure 6.2 describe the characteristics of persona used during the design of the prototype.



Profile

Name: Stanley NJ

Sex: Male

Age: 25

BMI: 27.4

Occupation: Master student

Physical exercises level: Occasionally, once a while

Technology skills: Good

Goal

I wish to loose weight and I would be happy of having a comfortable body shape.

Physical activities

I don't enough physical exercises. Once a month, I don't have fixed time to exercise.

Needs

I would like to have a companion during my exercises as we can enjoy while doing physical exercises.

I would like to be aware of sport events that are planned so that I can participate. Taking part in competition would be increasing my motivation and self-confidence.

Challenges

I am not happy with my weight.

I know the importance of physical exercises, however I have a problem of losing motivation, even inn my free time I don't plan to go out to exercises. Physical exercises is not part of activity priorities.

Sociability

I live in students dorm, even though I am not friend with all but I know most of the people living in my building.

I like being with friends, enjoying and having fun with them reduce schools stress as most of the time I come back from school tired.

I stay in touch with my friends through phone and email, I love chatting with them and knowing their news.

Figure 6.1: Primary persona


	<p>Profile</p> <p>Name ; Fidia</p> <p>Age: 32</p> <p>Sex:Female</p> <p>BMI: 25.97</p> <p>Occupation: worker(public servant)</p> <p>Physical exercises level: 1per week</p> <p>Technology skills: Good</p>
<p>Goal</p> <p>I would like to lose weight and get the same weight I use to have three years ago</p>	
<p>Physical activity</p> <p>I am not doing sufficient physical exercises</p>	<p>Needs</p> <p>I would like to reduce some weight and also getting a healthy body.</p> <p>I would like to have some sport facilities nearby me</p> <p>An attractive sport environment .</p> <p>Challenges</p> <p>Due to many work and family responsibilities I don't find enough time for a sport activity.</p> <p>I live in an environment that I am not familiar with,</p> <p>I don't have much contact with neighbors.</p> <p>I have no gym at my residence.</p> <p>Being bored and get tired when I am exercising.</p>
<p>Sociability</p> <p>I like being part of community, making new friends and hanging out with them. The method that I used to communicate with them is the phone through calls, text message and social media.</p>	

Figure 6.2 Secondary persona

6.3 Storyboarding and use cases

This section illustrates the context to which ideas described in the previous section 5 “Interview results” are being applied to the prototype application .It details the circumstances to which the potential user can interact with the concept to perform their tasks. The description of the scenarios is done by using texts and drawings in form of sketches .Those sketches help to understand the concept of the social sports application. In the following section 6.5, the features corresponding to each scenario are developed in the mockup prototype.

Scenario 1: Joe is checking if there are friends or people playing at XYZ location to join them

In this scenario described in the Figure 6.3, Joe is shown on the picture 1 after finishing his classes, he wishes to go out and play with his friends. As Joe has no idea of who might be free to go and play with him, he is now using his phone to check people who might be interested. Illustration given in the picture2, shows that he is checking people who might be at XYZ location for a football game. On the picture3, the sequence shows that has just found three of his friends Mike, John and Peter already playing at the location. At the last picture 4, Joe has is satisfied and has just started playing with other. This scenario refers to the idea of getting a *companionship* resulted from the user study in the section 5.

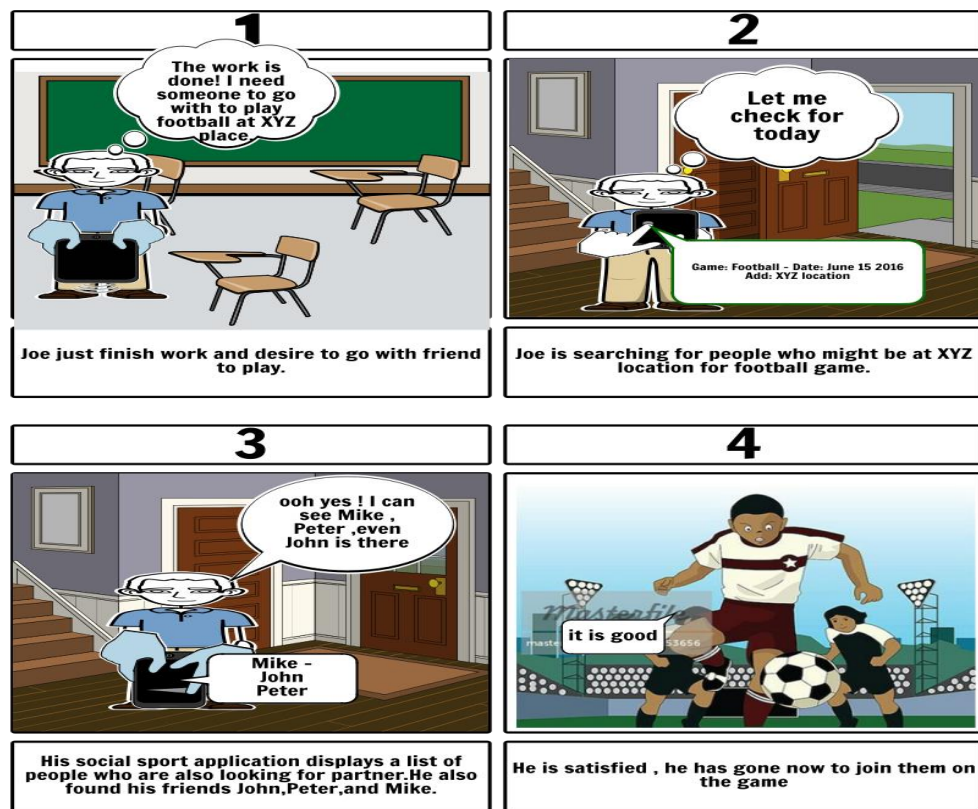
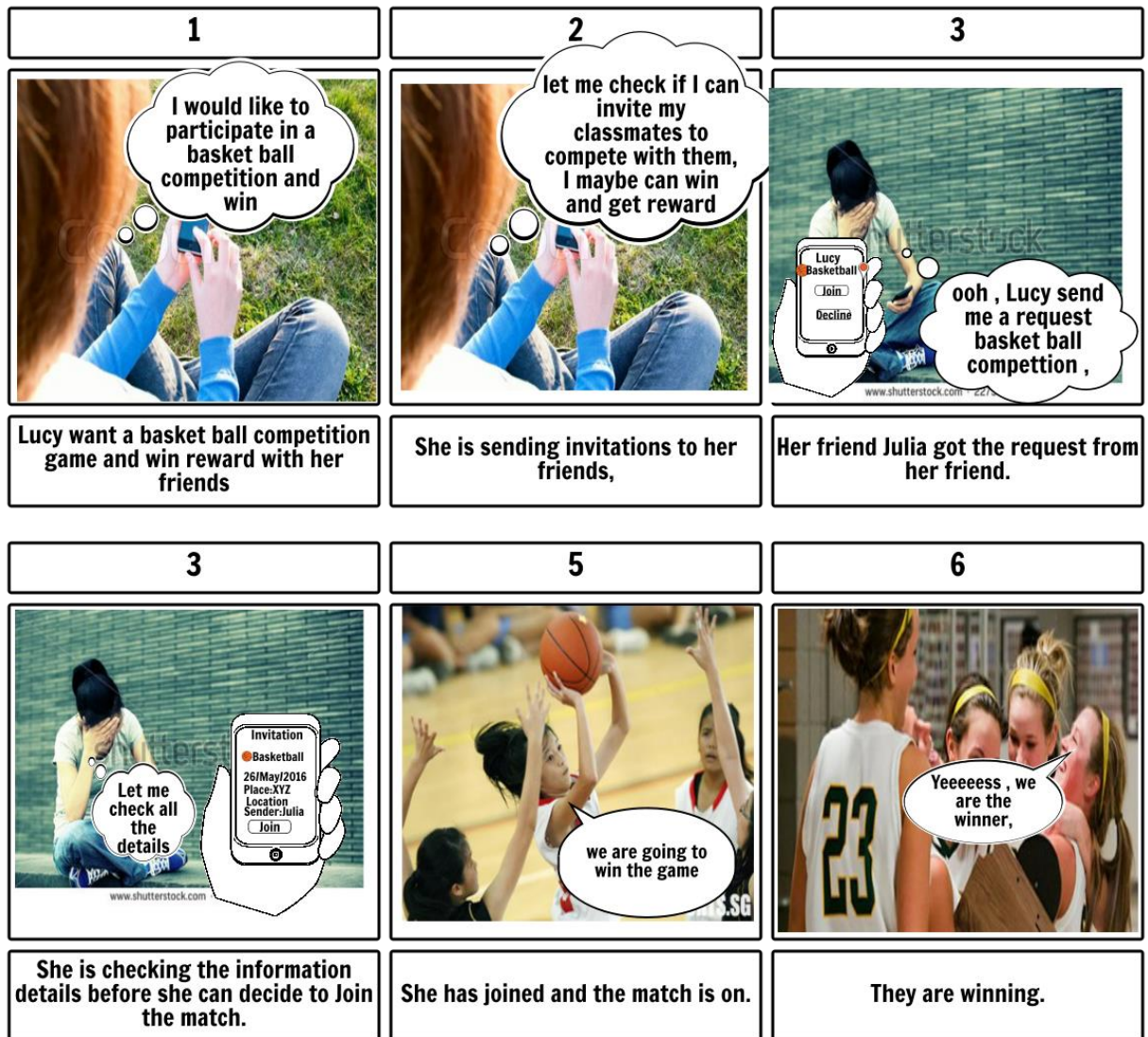


Figure 6.3: Storyboard illustrating scenario 1

Scenario 2: Lucy wants to enjoy a sport event or competition with her classmate

On the Figure 6.4, Lucy has a desire of participating in a game and win it, she wants to compete with her friends on a basketball match. As shown in the picture 2, she decides to invite her classmates by sending a game invitation request to each of one. On the picture 3, her friends Julia just received Lucy's invitation for a basketball game. On the picture4, Julia checks friends who already accepted to participate. Julia then decides to join the game. The two last pictures 5 and 6, show that they have already started enjoying the game. This scenario refers to the idea of *creating event or competition* among friends presented in the section 5.

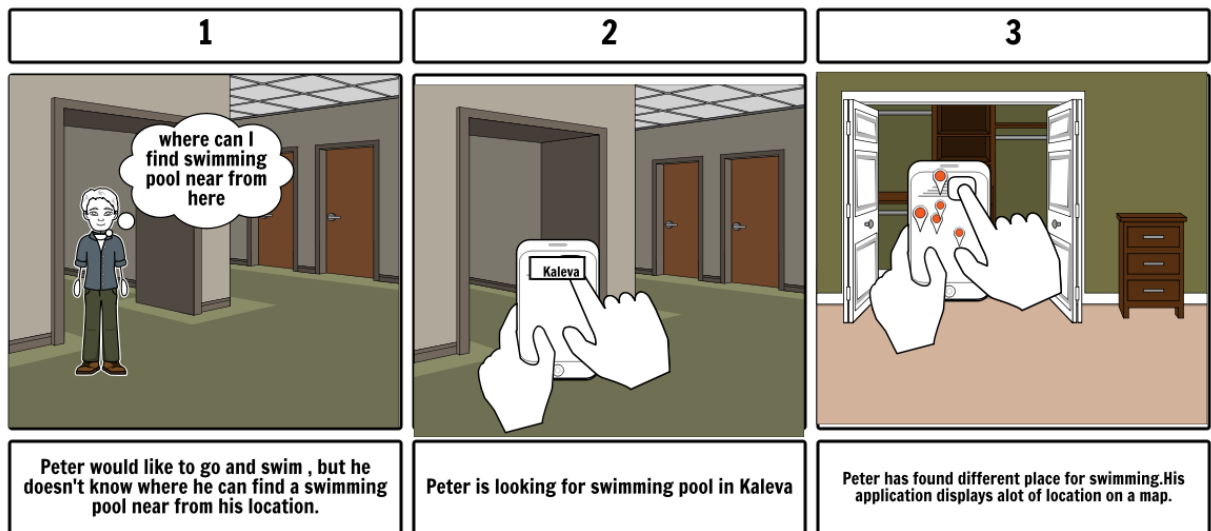


Created with Storyboard That for Mr IHTE

Figure 6.4: Storyboard illustrating scenario 2

Scenario 3: Peter is looking for swimming pool near his location

The Figure 6.5 shows the user looking for the nearest swimming pool to her home address. The person described in this scenario is named Rose, she feels a desire of going to swim but she does not know any location where she can find a swimming pool around where she lives. She logs in her social sports application, she enters her address and the sports activity she wants to do. On the last image, her application displays all the swimming pool available and the distance to her home. This scenario refers to the section 5 resulted from the user study about finding *the sport facilities*.

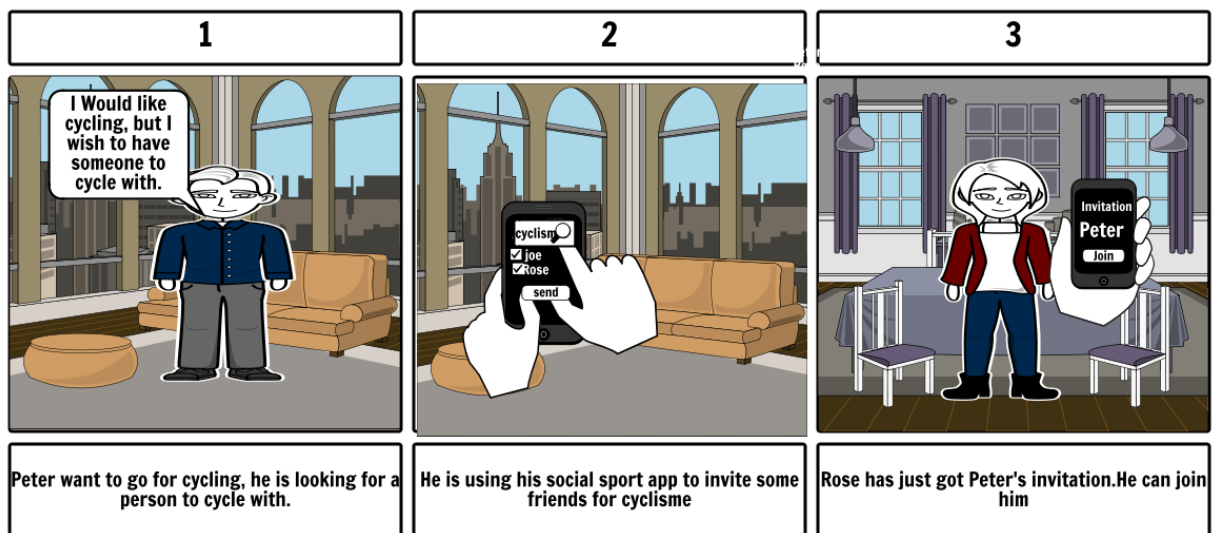


Created with Storyboard That for Mr IHTE

Figure 6.5:Storyboard illustrating scenario 3

Scenario 4: Peter wants to go for cycling but he is looking first for companionship

In the picture1, Peter wants to go for cycling. He feels bored to cycle alone and he needs to find a partner to join him. On the picture 2, Joe logs in on his online social sport application to search for a partner. The parameter that he has to identify include the sport activity and place. After searching on his social sport tool, Joe can view the list of people who are also looking for partners , among the list displayed he found his friends Rose, Joe, and Mike and he sent them invitation request .At the last picture 4 ,Rose got an invitation and she has to agree whether she can join him or not. This scenario refers to the idea of getting a companionship presented in the section 5.1 of the user study.

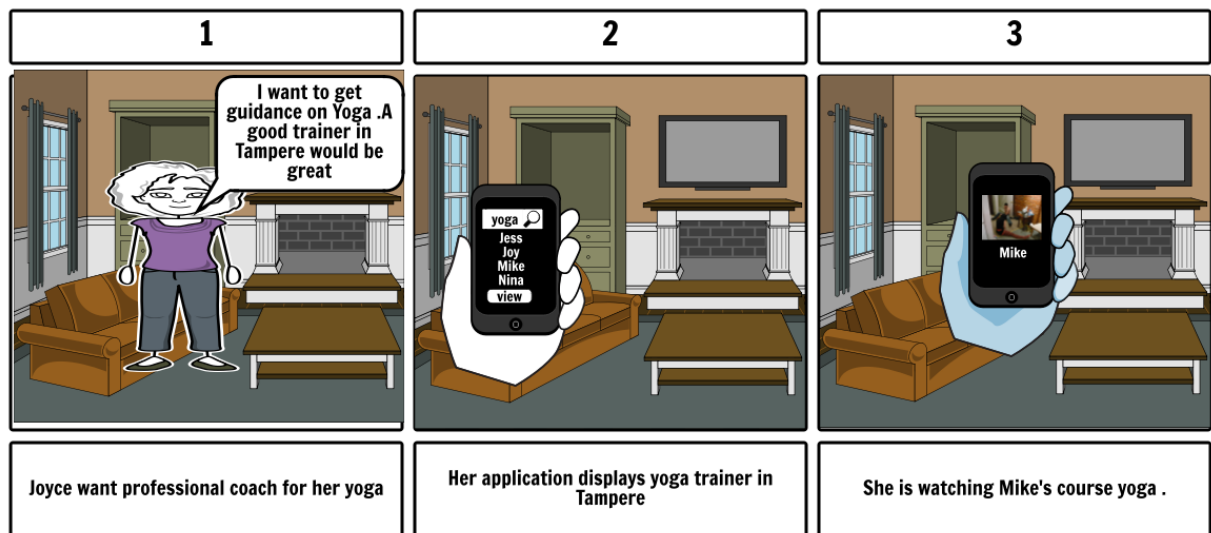


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Figure 6.6: Storyboard illustrating scenario 4

Scenario5: Joyce needs to get guidance from a yoga professional trainer

The sketch story illustrated in the Figure 6.7 below describe how Joyce proceeded to get a professional trainer in yoga. On the picture 1 Joyce is wondering how he can get in contact with a professional trainer in yoga. She then decides to search trainer who are located in Tampere, the picture 2 shows her application has found a list of trainers that she has to check and see their performance. The last picture3 Joyce has selected the trainer Mike and she is watching his video ,if she gets interested by his course he can follow him online or then get in touch with him. This scenario corresponds to the idea of *professional trainer* presented in the section 5.1 of the user study results.



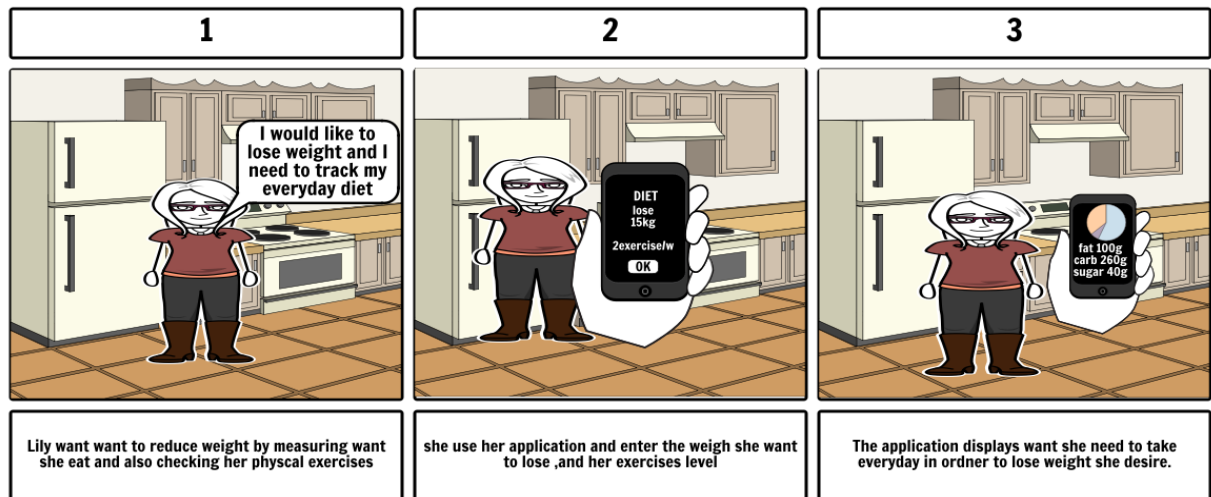
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Figure 6.7: Storyboard illustrating scenario 5

Scenario 6: Lily decide to measure her daily diet

This scenario in the figure 6.8 shows that Lily is worried about her weight and she wishes to lose weight. She has set a goal of losing 15kg as illustrated in the picture 2. She entered the number of kg she wants to lose and her physical activity level. The result on the picture 3 shows that the application displayed a number of calories she needs to spend and the content of the food that she needs to eat. This scenario illustrates the idea related to *measuring personal diet* presented in the section 2.5 about the review of features in existing applications.

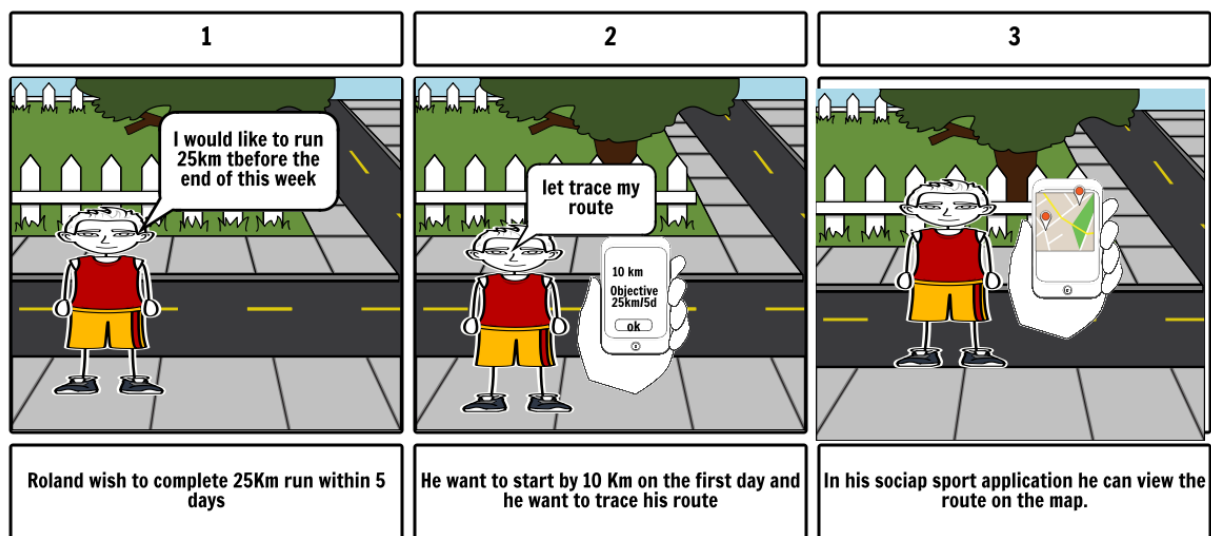


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Figure 6.8: Storyboard illustrating scenario 6

Scenario 7: Track physical exercises

The Figure 6.9 illustrates the social sports app of Rolland who wants to make 25 km within 5 days. On his first day, he would like to make 10 Km and he uses his application to trace a distance corresponding to 10Km. On social sports app he can view the distance the route on the map and the application plays the role of guiding him along his route. This scenario resulted from the supportive features for physical exercises available in the section 2.5 related to the review of existing application.



Created with Storyboard That for Mr IHTE

Figure 6.9: Figure illustrating the scenario 7

6.4 User Environment Design

This part consists of the User Environment Design (UED), it shows the structure and functions of the system .This UED supports the design part in a form of the architecture of the prototype of the sport social application. It shows the contains of each part of the concept, the features, and parameter required to perform a task. The scenario described in and storyboard of the concept can be understood through the system architecture and see how tasks are performed with the prototype.

All the ideas that came out from the user study and illustrated in the storyboard and scenario are described in the UED (Figure 6.10, Figure 6.11 and Figure 6.12). The "Menu" is the main part of UED, it contains all the feature of the concept which are My partner, My event, sports facility, Diet and My trainer. With My partner feature, the user can easily find someone to exercise with by using the system. The parameters needed to be specified are the sports name, team, and date and the address or location of the game. Another part of the UED consists of planning event, through this part the user can invite friends or other people for a sporting event, he can also join a team. To perform this task the user needs to specify the user name that he wants to invite, the team, address, and location of the event. By using sports facilities, the user can search and find the nearest place suitable for his desired physical exercises. The parameters needed to be identified are the user's location and the name of the sport. My community part helps to find forum discussion and group for the users to share experience, story, success, and interact with other. The last feature of the menu concerns dietary. My Diet is the feature that helps the user to manage the contents in his or her food. The results that the system has to display are the list of the sport specified and the exact address of the location.

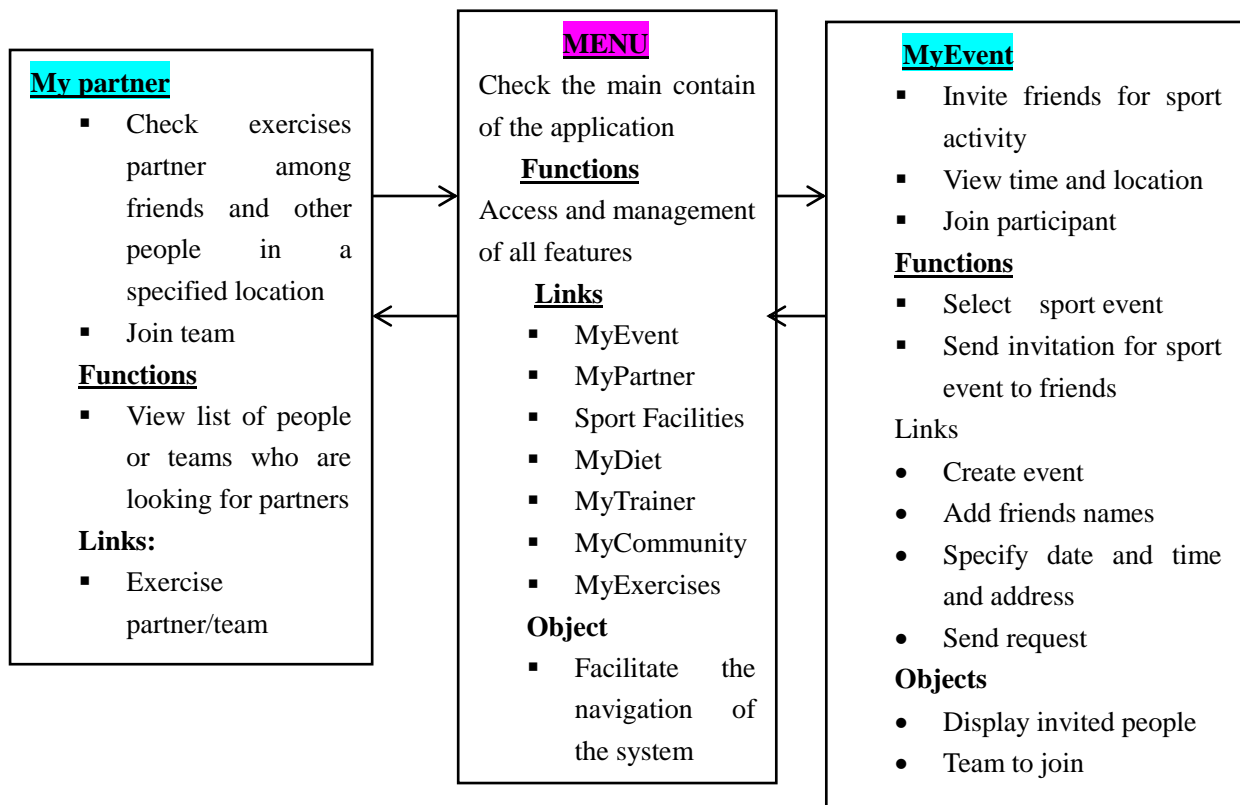


Figure 6.10: Architecture of the whole concept (1)

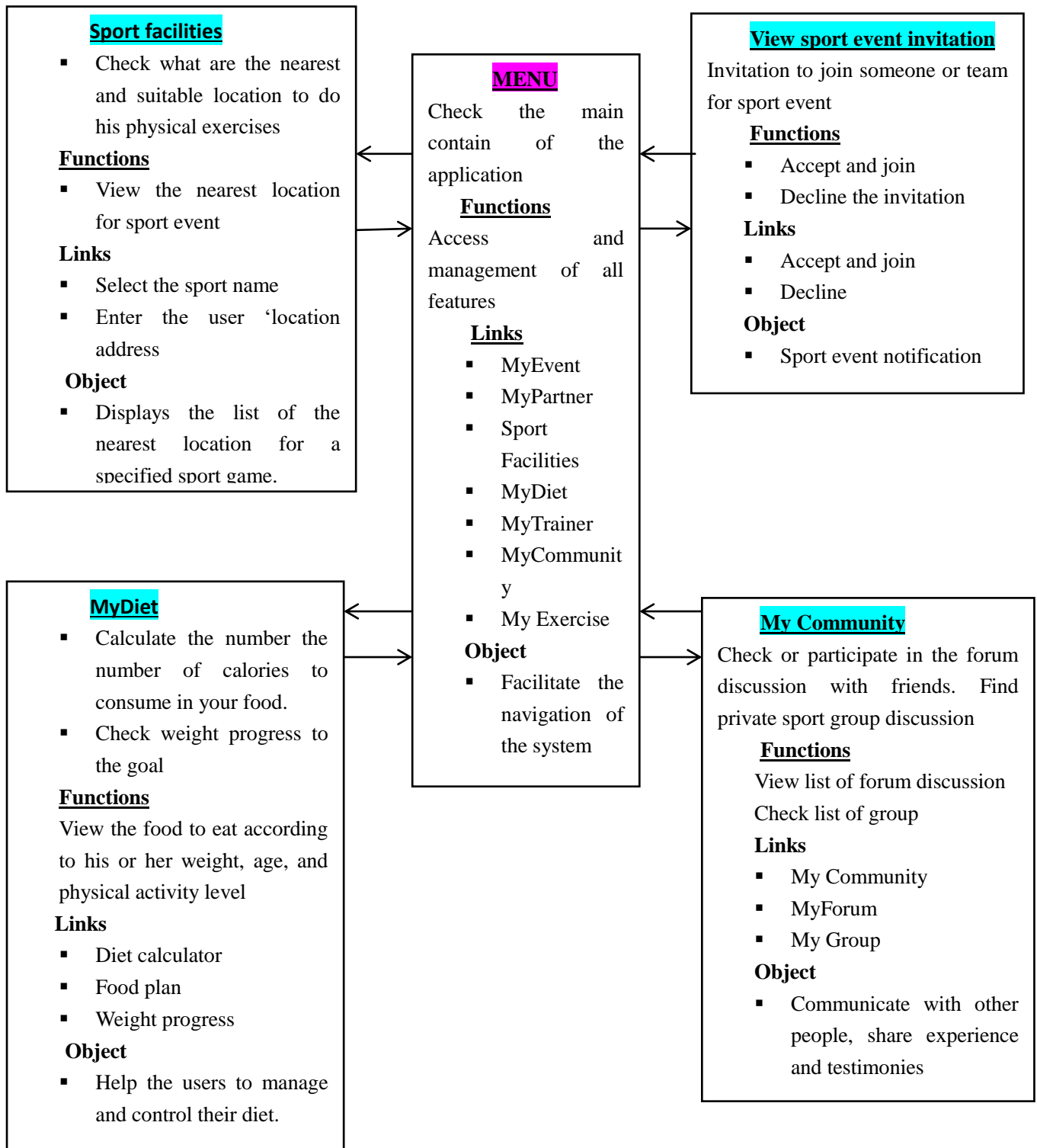


Figure 6.11: Architecture of the system (2)

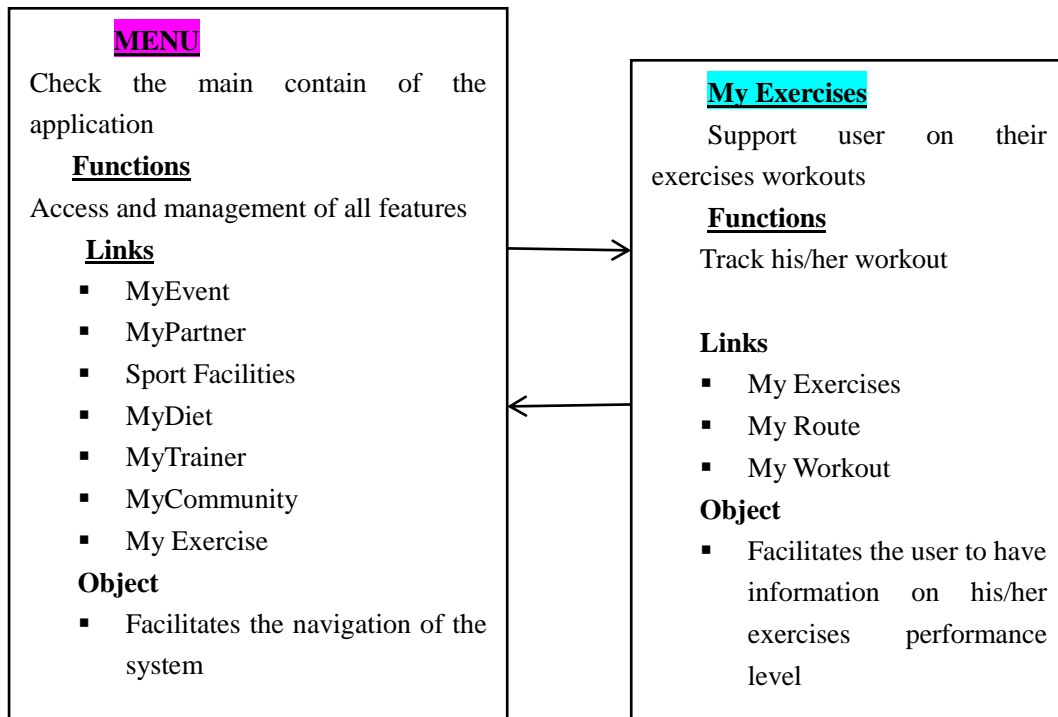


Figure 6.12: Architecture of the system (3)

6.5 Prototype design

In this section, the features corresponding to each scenario described in the section 6.3 and UED section 6.4 are developed into a prototype application. A detail description of each feature of the social sport app explains how the users can interact with each feature to perform their task

1. Log in



Figure 6.13: Login page

As shown in the Figure 6.13, the login page is made by an image showing the logo of the application, followed by the identification part of the user. The user has two possibilities of log in, he can either log in by using his or her own social media account such as Facebook or twitter or simply create an account with username and password on the application through “Sign up” available down at the right corner of the log in page.

2. Menu

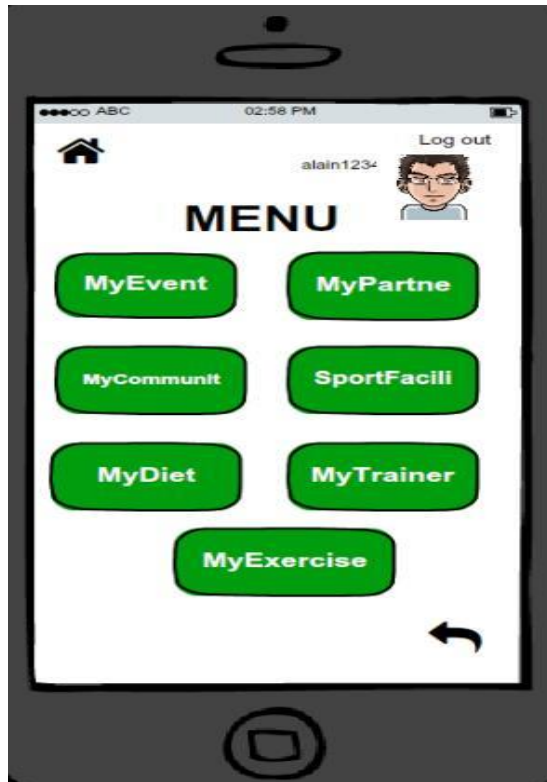


Figure 6.14: The page illustrating the main menu

As shown in the figure 6.14, the main menu page shows seven different features. The main feature of social sport app contains My Event, My Partner, My Community, Sport Facilities, My Diet, My Trainer and My Exercises. Each of these main features contains other sub-features. My Event contains the sub features related the management or creating of sports events. Second is My Partner feature that includes all useful sub-features that can help the user to search for companionship. Following is My community feature that helps the user to discuss between each other. Sports facility feature concerns the localization of sports activity of the users. My Diet feature deals with the nutrition and food plan of the users. My trainer deals with coaching and guidance from a professional. The last feature is My Exercise, which allows the user to track their physical exercises.

3. My event

My Event feature shown in the figure 6.15 allows the user to schedule or create a sporting event and invite other people to join it. The pictures bellow show that the user needs to enter the name of the sporting event, the place of the event and select the names of the people he or she wants to invite. Through this feature, the users can easily organize sports meeting and competition. The invitation

page shows the icon and the name of the sport activity displayed on a map with the address location. The invitation page possesses a button to accept or decline the participation to the event. This is a feature that was developed as the results from the scenario 2 in the section 6.3.

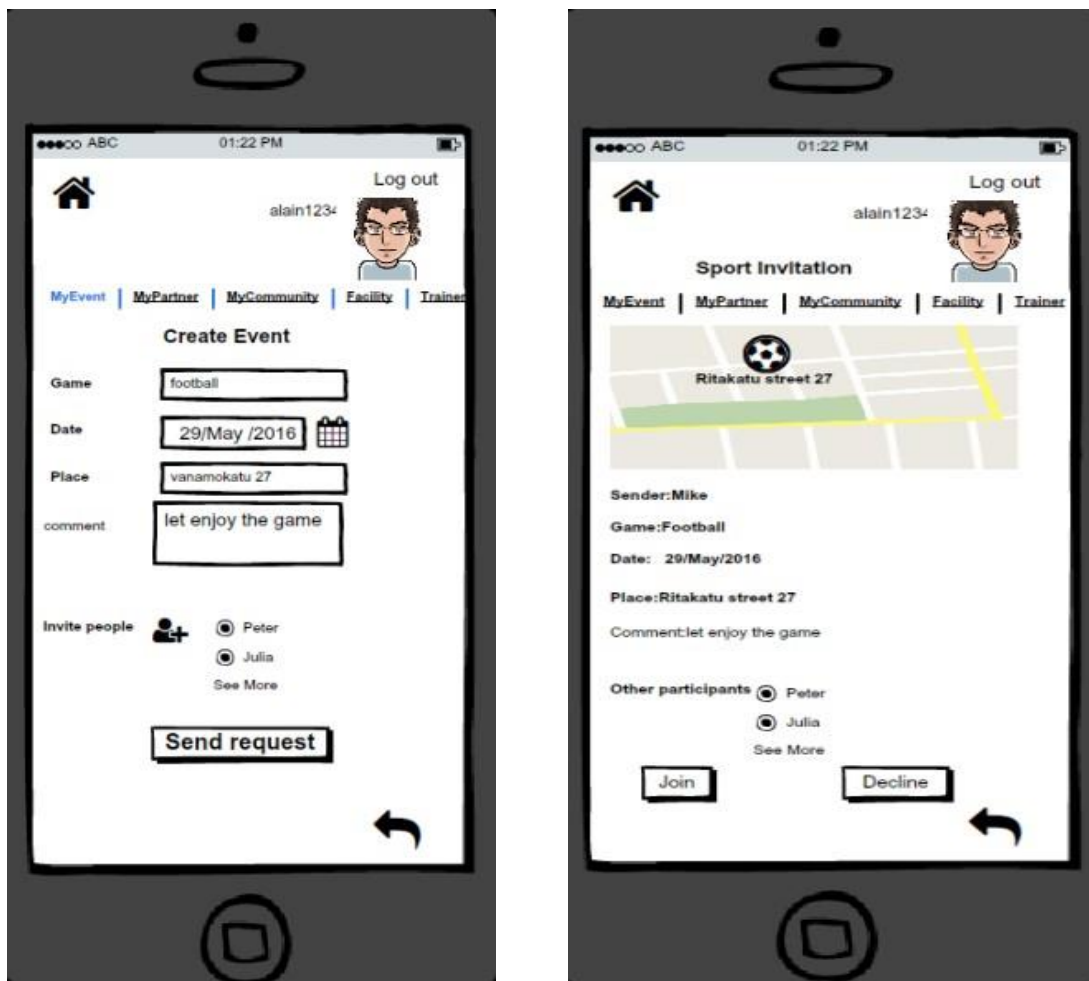


Figure 6.15: Pages illustrating how to create event and sport invitation



Figure 6.16: Illustration of My future event feature

The figure 6.16 illustrate the list of sport invitation that the user has. It shows a number of elements describing the invitation. Those elements includes the name of the game and its logo, the date, the name of sender of the invitation and two buttons for the receiver to accept or decline the invitation. From this page, the user can also create his or her event and invite people too by pressing the create button at the left corner of the page.

4. My Exercises partner feature

My Partner feature gives the users the freedom of searching their exercises partner team; view his or her friend sport schedule. As illustrated in the figure 6.17, the user selects the name of the game, enter the location and specify the day. The results page is displayed with a list of name of people who are looking for partners for the same sport. The user can select a name of the person he or she wants to join. The Figure 6.18 shows information of the person who is going for cycling, The page shows the date, the location to cycle from, the route and the final destination. The page possesses a "Join" button to send a notification as request for joining him or her. This feature refers to the scenario 4 in the section 6.3.

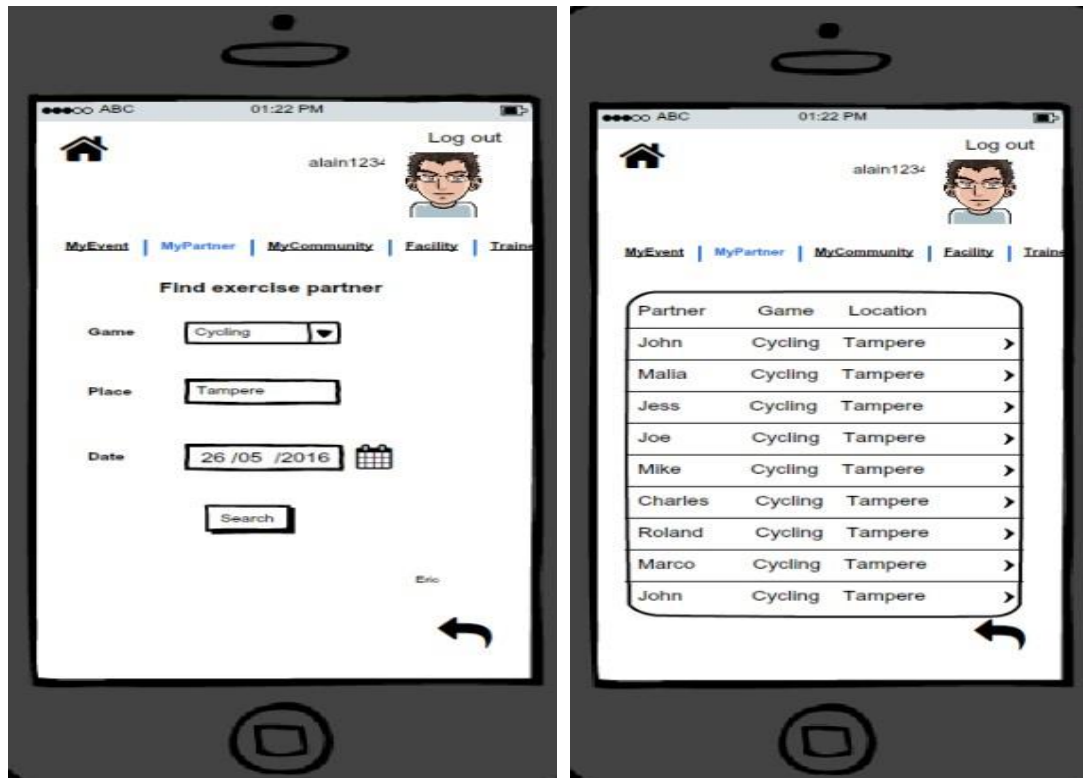


Figure 6.17: illustration of my partner features

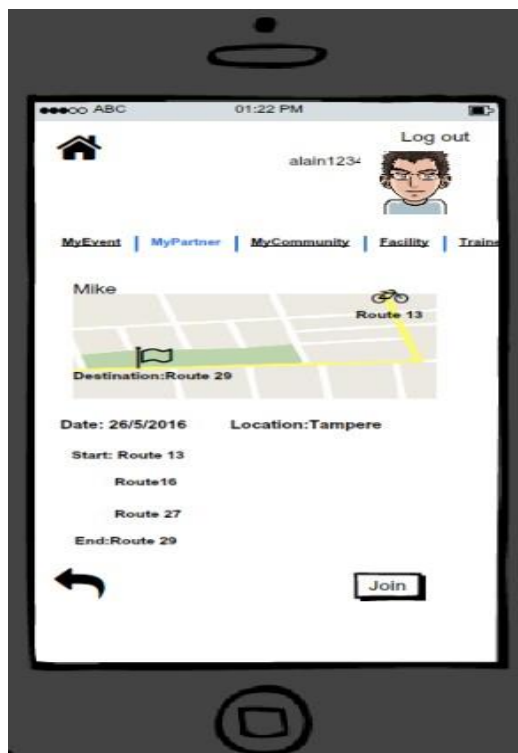


Figure 6.18: pages illustrating of how to find exercises partner

5. Professional trainer

My trainer feature allows the user to search for an exercise coach. The Figure 6.19 shows that the user has to enter the name of the sport. The application displays the names of the trainer and their location. The user can select the name of trainer and watch his or her videos. If she is satisfied, she can select him or her and contact him to be his or her trainer. In this feature, people can post comment and discuss about the trainers. The feature refers to the scenario 5 in the section 6.3.

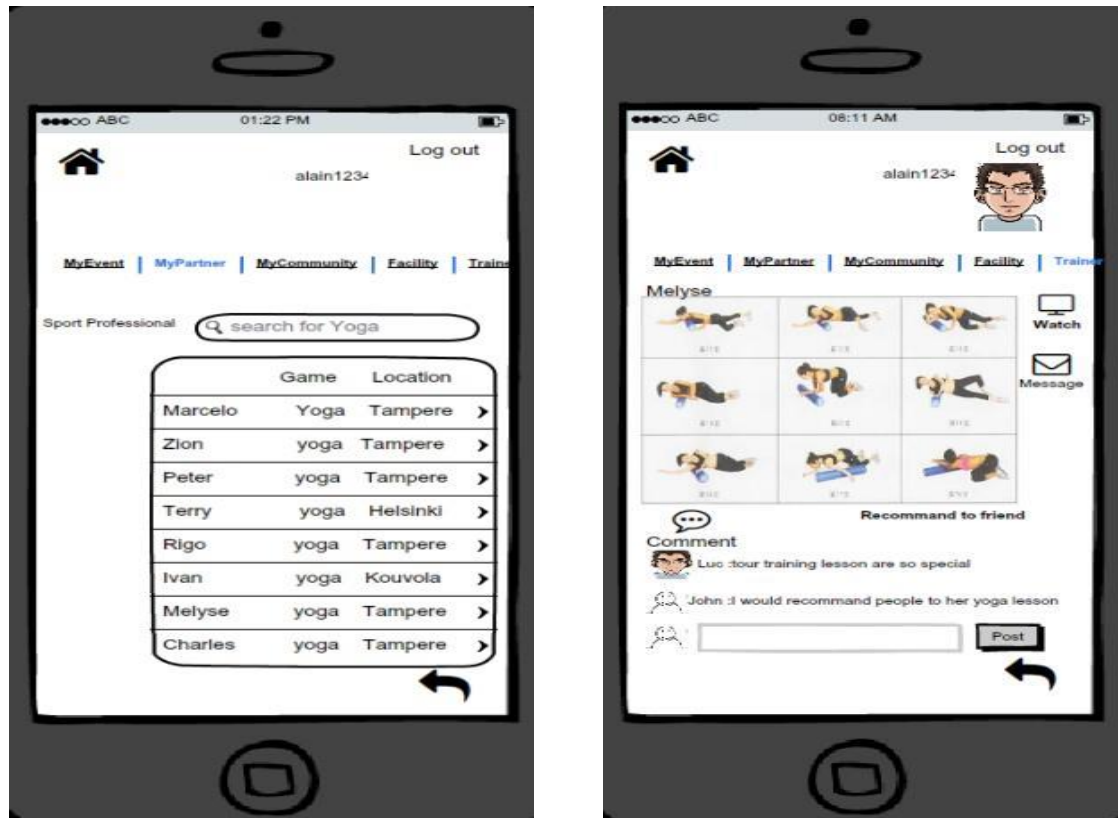


Figure 6.19: Illustration of My trainer features

6. Sport facility feature

As shown in the figure 6.20, sport facility feature allows the user to search for a suitable physical exercises location. By using this feature, user select the location and the name of the sport activity and as result to the search the social sport application display on the map all the address of the sport location in that area. The idea of this feature resulted from the user study and the brainstorming. During the user study; many participants expressed the need of sport facility as one of their motivational factor. This feature refers to the scenario1 and 3 in the section 6.3 of this thesis.



Figure 6.20: pages illustrating how to search for sport location

7. Community feature

As shown in the figure 6.21, using My Community feature can help the user search for a group or a forum discussion. The user can search for a forum discussion by specifying the name of the game, or the location. The results are displayed to another page with all the forum that correspond to his or her search specification. In the Figure 6.22, users can communicate with others participants to the forum and share their experience and stories about physical exercises. With this feature, users have the possibility to create groups of friend users. Similar to a forum discussion, creating a group allows close friends to discuss about sport and encourage each other for their performance. In addition ,users in the group discussion can comment ,chat between each other. Users can see the profile and other information about the achievement of other such as weight loss record (Figure 6.21 and Figure 6.22).

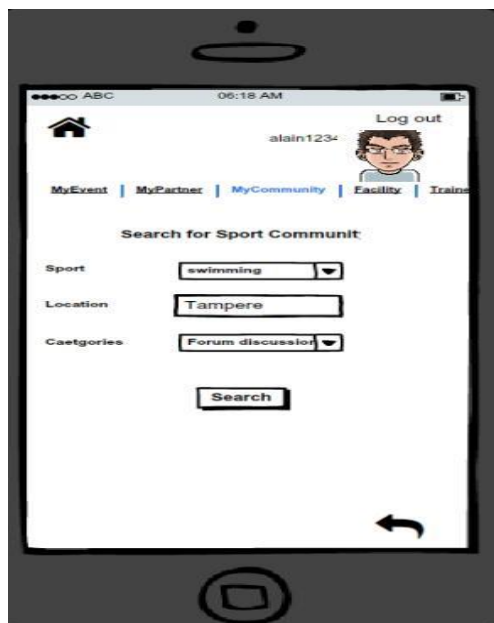


Figure 6.21: Figure illustrating search for sport Community feature

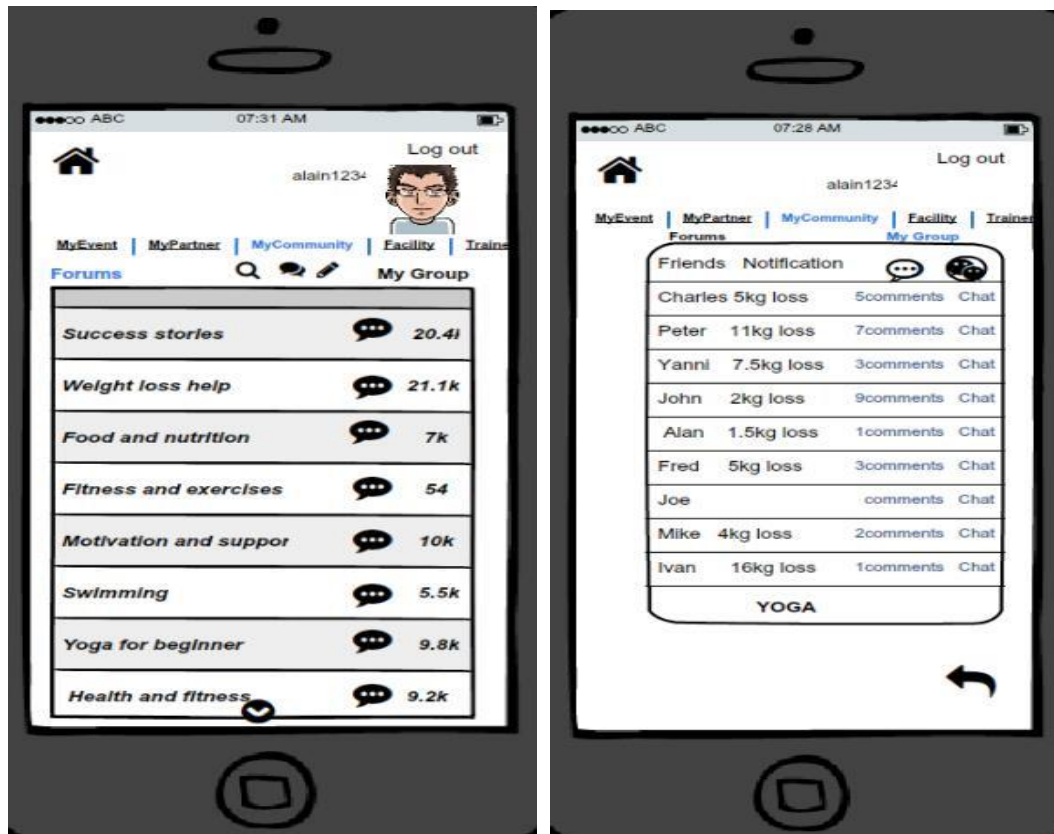


Figure 6.22: Figure illustrating forums and group discussion



Figure 6.23: Figure illustrating user records

8. Diet feature

As shown in the figure 6.24, the Diet feature aims to help users to measure their food calories. To calculate calories intake, the user has to specify his or her gender, weight, desired or weight goal and his or exercises level . The results displayed show the number of calories that users should take per day in order to reach his goal. User can manage his or her foods by using food plan feature and it shows different type of meals, breakfast, lunch, snack ,dinner etc. Users have the possibility to track their progress toward the goal as shown in the Figure 6.25.

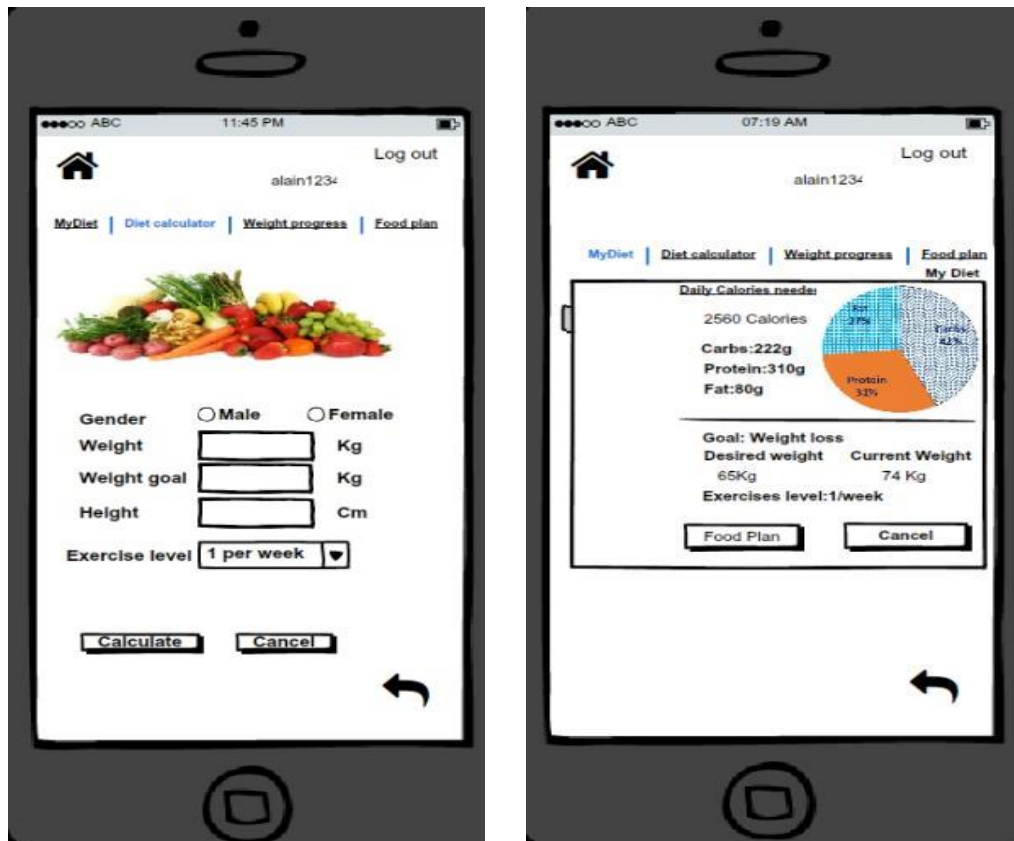


Figure 6.24: Figures illustrating diet calculator and user diet recommendation

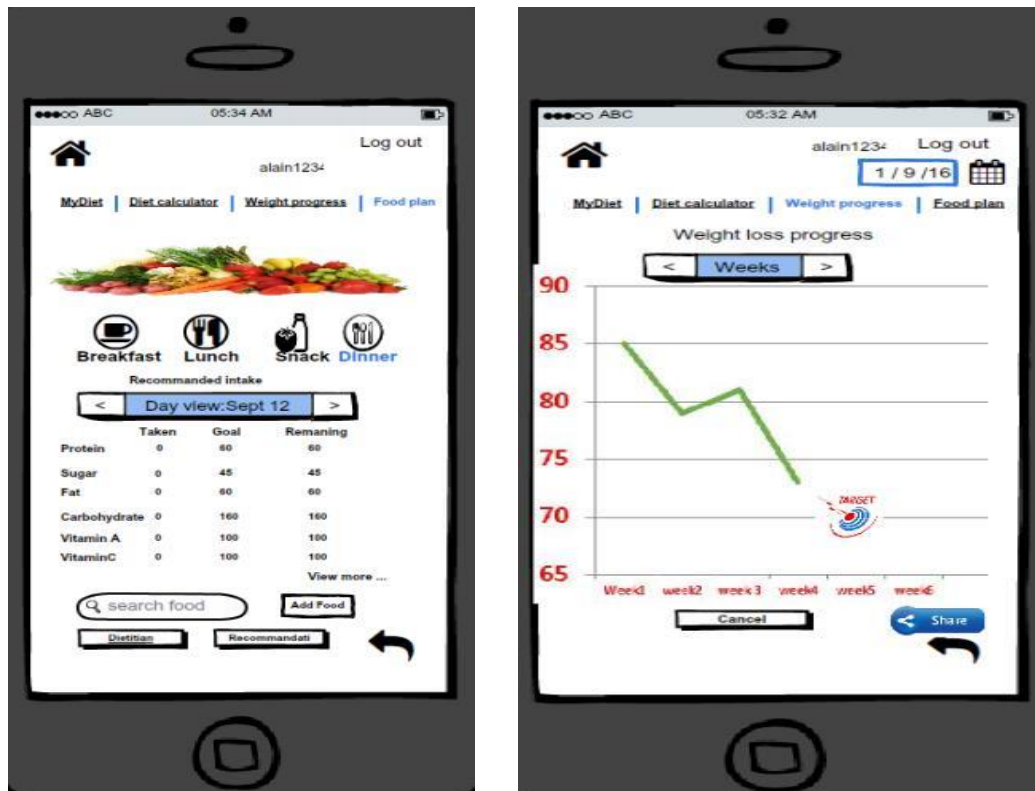


Figure 6.25: images illustrating user diet report and records

9. Track exercises

As illustrated in Figure 6.26 track exercises feature allows the users to plan or track their exercises. The user can set challenge according to his or her physical exercises level. In addition, the user can plan his or her route for example for cycling sport, the user has the possibility to trace his or her route on the map. The summary of user workout is given for each month which allows him/her to check the total duration, total time and distance traveled. In each month the user can see the number and record of workout he or she did each day. This feature allows the user to share his or her workouts with friends and other people. It also allows users for posting comments. The idea of designing this feature is related to the features reviewed in existing applications section 2.5.

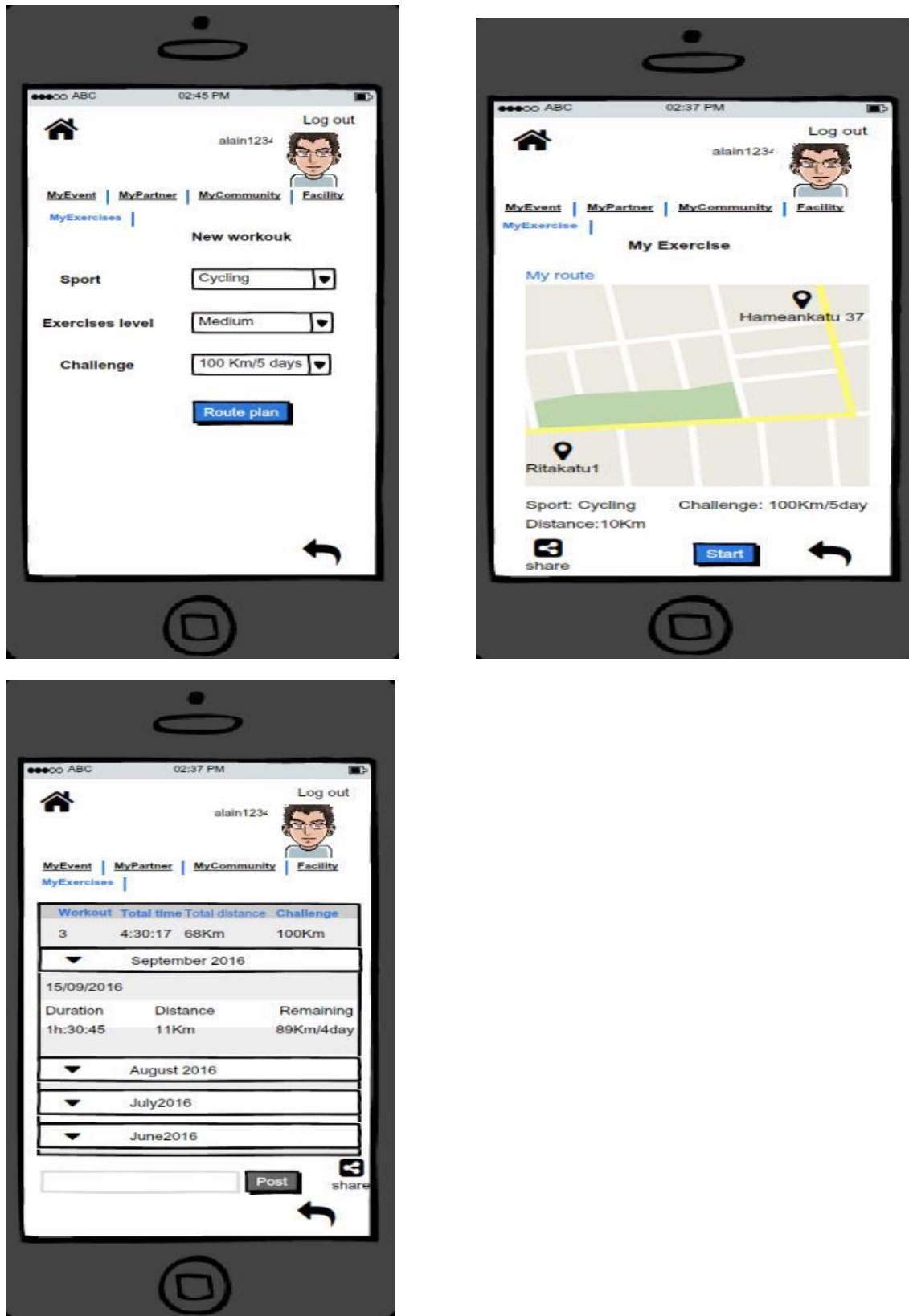


Figure 6.26 images illustrating exercises tracking process

7. EVALUATION

This section evaluates the design strategies used this thesis to design the prototype. It is divided into three parts; the first part reviews some of the design models. The second part indicates the design strategy that was selected to be used to realize the social sport application prototype. In addition it answers third research question of this thesis” **What are the design strategies that can be adopted for the new prototype application design to help increasing physical exercise motivation?**” The third part concerns the prototype evaluation with the users.

7.1 Evaluation of the design strategies used in application that support physical exercises

A number of studies published on mobile applications used for physical exercises have focused on the design strategies for technology that motivate people for physical activities. This subsection reviews four studies of different researchers including Yoganathan et al 2015, Sunny Consolvo et al 2006, Ahtinen 2015, Patrick C. Shih et al 2015.

Yoganathan et al (2015) explain that Fitness applications success refers to the fact they can address the needs of the users (Yoganathan & Kajanan 2013) [20].An application that can increase the user's performance during physical exercise is positively rated and recommended to their friends. Yoganathan et al (2015), revealed a model that consists of four aspects that including increasing the self-efficacy, outcome expectation, self-regulation or goals-setting and social facilitation.

The first aspect which is self-efficacy refers to people confidence about their capabilities and willingness to achieve their goal or their desired performance(Bandura 1986).Designing applications with features that increase self-efficacy can help in people changing behavior and adoption more and more an active lifestyle and push the user to continuously use the fitness apps. The design should avoid complexity and turn hard exercising behaviors to easy and simple tasks (Yoganathan & Kajanan 2013)[20]. When a complex exercise is turned to easy tasks, it enhances the motivation toward the exercise (Fogg 2003) [14]. User’s guidance during physical exercises can increase their self-efficacy (Yoganathan & Kajanan 2013)[20] .The design that can help to guide user while exercising can create or positively enhances attitudes on physical exercise and increase user self-efficacy (Fogg 2003)[14].

Second is the aspect of individual’s outcome expectation which is referred to the fact a given behavior can produce the anticipated results (Bandura 1986).The design of a persuasive technology with features that include the aspect as simulation , conditioning and suggestion can help people to get the expected good results. Third is the self-regulation, which explains the norm people can set on their lifestyle in order to attain a certain goal (Bandura 1986). Persuasive technology that consists of self-monitoring or tailoring can push people to set and regulation of strategies that can lead them to reach a good achievement (Yoganathan et al., 2015).The fourth and last aspect is the social facilitation which is referred to the social structural aspect that leads people to be physically active (Yoganathan & Kajanan 2013)[20]. Design techniques that have to be adopted include normative influence, social comparison, competition, cooperation, and social recognition. These can increase people’s level of physical activity.

Sunny Consolvo et al 2006 presented four design strategies for technologies that motivate people for physical activity. Those strategies firstly include giving users proper credit for their activities, provide personal awareness of activity level, support social influence, consider the practical constraints of users' lifestyles. In giving users proper credit for their exercises (Consolvo et al 2006) [21], explain that technologies motivating people for physical exercises should consider the inadequacies in measuring or evaluating the level of people physical exercises. In order to find solution to this, the designer must get to know the common physical exercises of the people that they are designing for. In addition, the design has to allow the measurement limitation of the application and give the possibility to the user to edit or adding some additional data [21]. Second, the aspect of people personal awareness consists of allowing user to know the history of their past behavior, their actual status and the level of their achievement toward the goal. Thirdly is the aspect that concerns the social influence classified into three categories that include social pressure, social support, and communication. Social pressure refers to sharing records and progress between users, which can lead them to feel a sort of pressure to perform better or to avoid having the bad records. Social support consists of giving and receiving praise or to be encouraged by friends. The communication to be considered during the design should allow the users to not only share the records as the number or figures but also to add some comments about what the user really did (Consolvo et al 2006)[21]. The last design strategy concerns the practical constraints of users' lifestyles. The design should be done in a way that it encourages physical exercises. It should have complete and necessary features to support users. It has to combine all the features that the users can need to support him or her during the physical exercise.

Ahtinen 2015, presented a model with 34 design strategies used for motivational technology. Those strategies were classified in six dimensions that comprise "Support My Exercise, Be My Advisor, Grow with Me, Utilize My Sociability, Keep Me Engaged, and Visualize My Exercise". One dimension, which refers to Support my exercise, was the center and the most important compared to all other dimensions. It includes seven strategies as "Automatic tracking, Comprehensive tracking, Short- and long-term data, Goals setting, Progress towards goals, Acknowledging, and Reward." The five remaining dimensions were present as equal.

Shih et al 2015, presented model that describes how it helps people for tracking their physical exercises. The strategies of this model firstly include reminder, the application should be designed in a way that it remind the user to wear and use the device rather than activity goal. The design should include a mechanism with alert message to remind the users to keep on doing their activities for example exercises or diet [22]. "Workout buddiesLikeMe" is the second design strategy that explains that social interaction and friendship between people are very crucial to people wellbeing (Berkman et al., 2000) [23] and play an important role on how individual can adopt an active lifestyle through physical exercises (Sherwood & Jeffery, 2000) [24]. The third design strategy is the "Transparency and Trust in Activity Tracking" refers to avoid providing inaccurate data to the users. The system should expose the technical detail and informs the users as it can avoid ambiguousness in the tracking activities and pushes the users to select the most suitable situation to use the activity tracker [22].

7.2 Choice of the design strategies used in the design of social sport app of this thesis

The design strategy adopted in to be used in this thesis includes the model of Ahtinen (2015) .This section answers the third research question of this thesis “***What are the interactive design strategies of the product solution that can be adopted to help to increase the motivation in overweight people?***” The reasons for choosing this model were motivated by the fact that it presents a wide range of appropriate design strategies to be used for a motivational application for physical exercises. There some strategies that are found in more than one model. Ahtinen 2015 model combines many of the strategies that are found in other models. Not all the strategies that are in Ahtinen 2015 model were used, the focus were much more on the strategies that enhance physical exercises and sociability. The design strategies used in this thesis are present in the following dimensions:

Dimension 1 (Support My exercise) is the main and the center of design strategies of Ahtinen (2015) model. Seven design strategies are included in this dimension are” Automatic tracking, Comprehensive tracking, Short- and long-term data, Goals setting, Progress towards goals, Acknowledging and Reward”. The automatic tracking aims to track exercises data without making effort, the data have to be displayed automatically. The second strategy that consists of comprehensive tracking allows a track of many parameters. The third strategy focuses on keeping the past exercises data in the application and easily displays or shows the recent data. Fourth is the goal setting strategy that aims to set a short as well as a long-term goal for an exercise[12]. The fifth strategy, Progress towards goals allows the user to be aware of their progress to the goal and getting feedback on their performance during the exercise. The sixth strategy concerns acknowledging, it refers to the acknowledgment of the user’s achievement on the exercise through encouragement, appreciation, and praise. The last strategy of this dimension is reward, which consists of providing the reward to the users when they reach or complete their goal [12].

Dimension 1 Support My Exercise:

Design strategy	Features	Social sport app feature that includes the design strategy
S1.1: Automatic tracking	Available in Track my exercises, MyDiet,Diet calculator,	Track weight progress Track exercises
S1.2:Comprehensive tracking	not available	
S1.3: Short- and long-term data	weight progress My events	User can check his or her weight information and progress toward the goal. The user can also view his or her sport activity plan. Check the number of event he or she got from friends. The user can also check the address and time of the invitation he or she has as well as the information about the sender and other participants to the

	MyTrainer	game. The user also follows the exercises trainer. Check the information and video of the trainer that he or she is following.
	My exercise	Users have the possibility to track their workout and check their exercises record.
S1.4: Goals setting	Diet calculator	The user can set the goal related to weight he or she want to lose.
	My Exercises	Users can set challenge according to their physical exercise abilities.
S1.5: Progress towards goals	Weight progress	The user can check the report on his weight loss, which can allow him or her to see the progress toward the goal and the remaining effort to achieve it.
	My exercises	Users track their progress toward their goal. My exercises feature can allow them to see the total workout made, the total time and remaining effort to reach the goal
S1.6: Acknowledging	Chat and comments features	Through chat ,comments and text message user can get encouragement from friends and trainer
S1.7: Rewarding	Not available	

Table 7.1: Dimension 1, support My Exercise

This dimension presents five design strategies that were used in realizing the social sport application prototype. These strategies consist of **Automatic tracking** available in the prototype under MyDiet feature (Diet calculator). With MyDiet feature users can calculate their diet according to many parameters as current weight, desired weight, height, gender, and the level of physical exercises and the user can get a recommendation of the daily amount of calories he or she has to take. MyExercise feature was designed by considering Automatic tracking strategy, this feature allows the user to track his workout for example track distance, duration, route. **Short- and long-term data** strategy is available in the feature as *weight progress*, *My events*, *MyTrainer*, as well as *MyExercise*. In weight progress feature, users are able to check their information and the remaining effort needed to reach the goal. *MyEvent* feature aims to help to enhance social interaction for physical exercises between users. The user can view the number of sport invitations he or she got from other users and the number of

people invited to participate to the event. The **Goal setting** strategy refers to the *diet calculator* features and workout goal designed in the prototype .The user can set his or her future weight goal and get the information of what he or she needs to do to reach that goal. **Progress toward the goal** can be referred to the *weight progress feature* of the prototype which helps the users to track their progress overtime. The user can track their progress daily, weekly or monthly and the feature can display the report in form of numerical data or on the graphic. User can also track physical exercises workouts. Last design strategies used in this model concerns **acknowledging** which can be found in *chat and comment features*. In these two features, the user can give and receive praise and encouragement from friends and other people by chatting or posting praising comments.

Dimension 2: “Be My Advisor”. This dimension consists of human advices referred to the strategies described in the first dimension “Support My Exercise”. With this dimension, the users would appreciate that the application act as human by supporting and guiding the user the same way a personal trainer could do without just giving the numerical data[12]. Both Support My Exercise and Be My Advisory possess design strategies that have some similarities in the way that they are used for example the strategy about the goal setting is found in two dimensions but the difference is that one consists of goal setting as the basic feature and the other one as advisory.

Design strategy	Features	Social sport app feature that includes the design strategy
S2.1: Advisory role	MyCommunity feature and sub feature as Chat, comment and text message	The users can advise each other on their experience and weight loss performance through forum, chat ,message and comment
S2.2: Human touch	MyTrainer, MyDiet	users can get advice to other user or professional and recommend him or her on what type of exercises and nutrition he or she has to take.
S2.3: Goals setting advice	Not available	
S2.4: Planning exercises	MyEvent(CreateEvent),MyPartner(search for partner)	The user can plan and invite friends for a sport event or competition, plan a workout and invite friends or partners to join him or her
S2.5: Guiding exercises	MyTrainer	The user can get guidance from a trainer of his or her choice. Through MyTrainer feature, it is easy to contact him or her, watch training video trainers etc.
S2.6: Reminding	Not available	

S2.7: Glimpse to future	Not available	
S2.8: Explicit spur	Not available	

Table 7.2: Dimension 2, be My Advisor

In the **dimension 2**, four designs strategies were picked to be used in the design of the prototype. Those strategies concern *advisory role*, *human touch*, *planning exercises* and *guiding exercises*. **Advisory role** strategy refers to features such as *My Community* and sub feature as *Chat*, *comments* and *text message*. Those are the features that can be utilized by the users to support each other through chat, supportive comments. Trainer also can advise the user through those features. Human touch strategies is available through *My trainer feature*, trainer can guide the user on his or her workout. **Planning exercises** strategy allows user to plan event and find partner through features such as *My Event* and *My Partner*. With these features, it is easy to interact with each other for a sport activity. **Guiding exercises** is a strategy of the second dimension that was used in feature such as *My Trainer*. This feature helps the user to find guidance from trainer by viewing their videos and following their training courses. User can also get in touch online with them through text message. The rest of the strategies of this dimension such as *reminding*, *glimpse to future* and *explicit spur* were not used.

The dimension 4 (Utilize My Sociability), social aspect can positively contribute in changing people's behavior to being physical active. Doing physical exercises in-group or with friend can be motivational factors for people to increase their level of physical exercises. This dimension has a number of design strategies to be used in increasing motivation with social support or social influence [12].

Design strategy	Features	Social sport app feature that includes the design strategy
S4.1: Sharing	MyDiet feature and weight progress sub feature MyCommunity My Exercises	Users can share their weight loss progress and record between each other. They can also share their diet plan. Through my community friends can view and post comment on people weight progress and achievement User can share their workout record, post comment on friend workout achievement
S4.2: Cooperation and competition	MyEvent MyPartner	Allows users to create event and competitions and invite friends to participate. Allows user to invite friend or partner to join as a companion for sport activity.

S4.3: Re-union	Not available	
S4.4: Group formation	MyEvent MyCommunity	User can form a team by creating Event or competition. In my community ,user can search for a sport group or community in form of forum discussion where they can exchange ideas and encourage each other
S4.5: Role Models	Not available	
S4.6: Passing forward	Not available	

Table 7.3: Dimension 4, utilize my sociability

Three design strategies that consist of *sharing, cooperation and competition*, and *group formation* were used from the dimension 4. **Sharing** strategy includes My Diet feature and weight progress sub-feature designed in the prototype. My Diet feature and weight progress feature can allow the users to share information on their weight and progress toward the goal while My Community feature allows the users to view and comment on the performance and achievement of other users in the same group forum .It is a simple feature that promotes social communication between users. With My *Partner feature*, users can easily find a companion for their planned physical exercises. This feature can also enhance the friendship and social contact between users. **Group formation** strategy refers to My Event feature, which allows users to create an event and form a team or group of individual who can meet together and play. In this design strategy, we count also *My Community* which offers opportunity to the user to find a group discussion or forum with people that have common interest or topic that they can discuss.

Dimension 6: Visualize My Exercise

This is the last dimension of Ahtinen 2015 model. It includes strategies that help the user to get a description of the data of the user workout in addition to numerical records. It facilitates to check some meaningful wellness experience. This model includes four different design strategies as wellness experience, beyond number and familiar real-life metaphors and the beauty.

Design strategies	Features	Social sport app feature that includes the design strategy
S6.1:Wellness experience	Note available	
S6.2: Beyond numbers	Weight progress report	The users get to see the weight progress report in form of number and graphic information.
S6.3: Familiar, real-life metaphors	Not available	
S6.4: Beauty	Not available	

Table 7.4: Dimension 6, Visualize My Exercise

The last dimension used in this model is **Visualize My Exercise** with one design strategy “*Beyond numbers.*” That strategy concerns *weight progress report feature*, which allows the users to check their weight in form graphic. The graphic shows the user’s past weight record, the status, weight goal and the progress toward the goal. The user can view his or her weight progress daily, weekly or monthly.

7.3 Users test and feedbacks.

The design of the prototype was followed by the prototype evaluation with the users. Seven test users participated in the evaluation of the prototype. The participants were given tasks to complete and were asked to give their feedbacks and perceptions on different features of the prototype. A form of questions was given to every participant to give his or her evaluation score about the prototype. The questions were divided into three part the first part was about to give a general perception of feeling about the use of the prototype. The second questions part was to evaluate each feature of the prototype and the last part was about to give their own opinion and comment on the prototype. The first part and the second part participant had to evaluate the prototype by using the scale from 1to 5. The scales were described as 1=Very unsatisfied 2=Unsatisfied 3=neutral 4=satisfied and 5=very satisfied. The results of the user’s evaluation score are summarized in the Table 7.4 and Table 7.5

- **User perception on of the concept**

Participants Perception	U1	U2	U3	U4	U5	U6	U7	Average
The content of the application were important	5	3	4	4	4	4	3	3.8
I had difficulty to understand the concept	1	3	2	1	1	1	2	1.5
The appearance was nice	4	2	3	3	4	4	4	3.4
The home menu is easy to understand	5	4	3	3	5	4	3	3.8
Navigation from feature to another is easy	5	3	3	3	4	3	4	3.5
The use of the prototype is simple	4	2	3	4	5	4	4	3.7

Table 7.4: prototype evaluation score from user about general perception

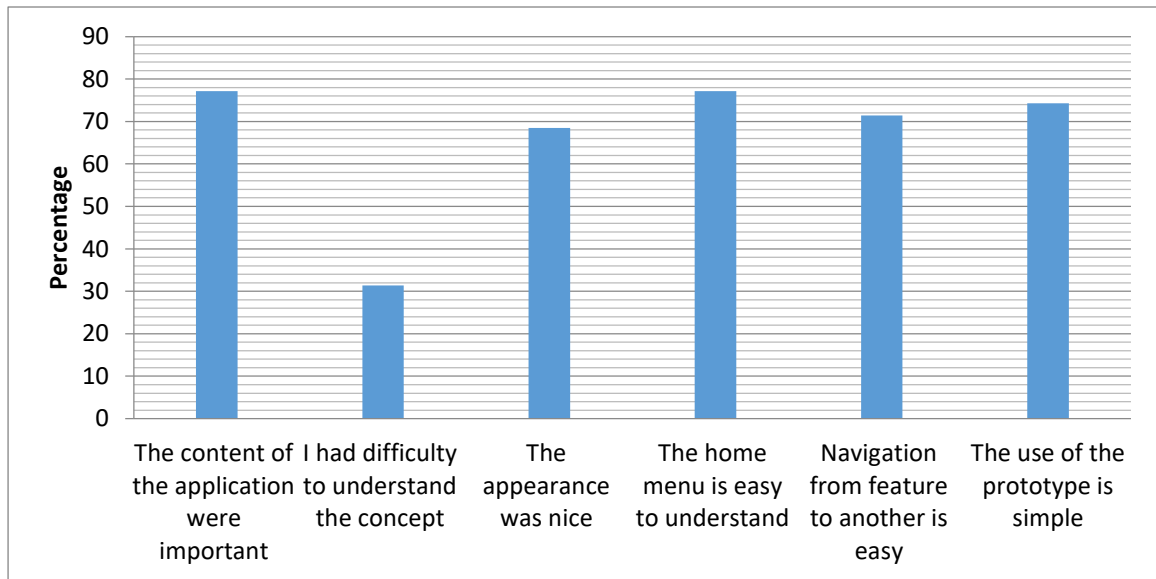


Figure 7.1: percentage score of users' perception about the features

According to the table 7.4 and figure 7.1 that illustrate how the users evaluated their interaction with the social sport application prototype. Overall aspect the content of the application were perceived to interest the majority of testers who rated this aspect with an average of 3.8 out of 5 approximately 78%. Most of the participant rated this aspect with 4, there was only one person that rated at 3. This aspect with a similar rate as the *simplicity of the home menu*, which was rate also with 3.8 out 5 corresponding to a score of approximately 78%. Follows the appearance of the application with an average of 3.4 out of 5 and *the navigation between features* that scored an overall rate of 3.5. Generally, testers did not meet any major problem with interaction with the prototype as it was revealed by the low score given to *the complexity of the use of the prototype* with only a score of 1.5 out 5 equivalent to 31%.

- **User satisfaction on different features**

Features \ Participants								Average
	U1	U2	U3	U4	U5	U6	U7	
Search partner feature was well structured	4	3	4	3	5	5	4	4
Create event feature is well done	5	3	4	4	5	3	4	4
Search sport facilities feature was good	5	5	4	5	5	4	4	4.5
Nutrition feature is easy to understand	4	1	2	4	3	2	3	2.7
Community feature is useful and well structured	3	3	4	3	4	3	4	3.4

Table 7.5: features score given by users

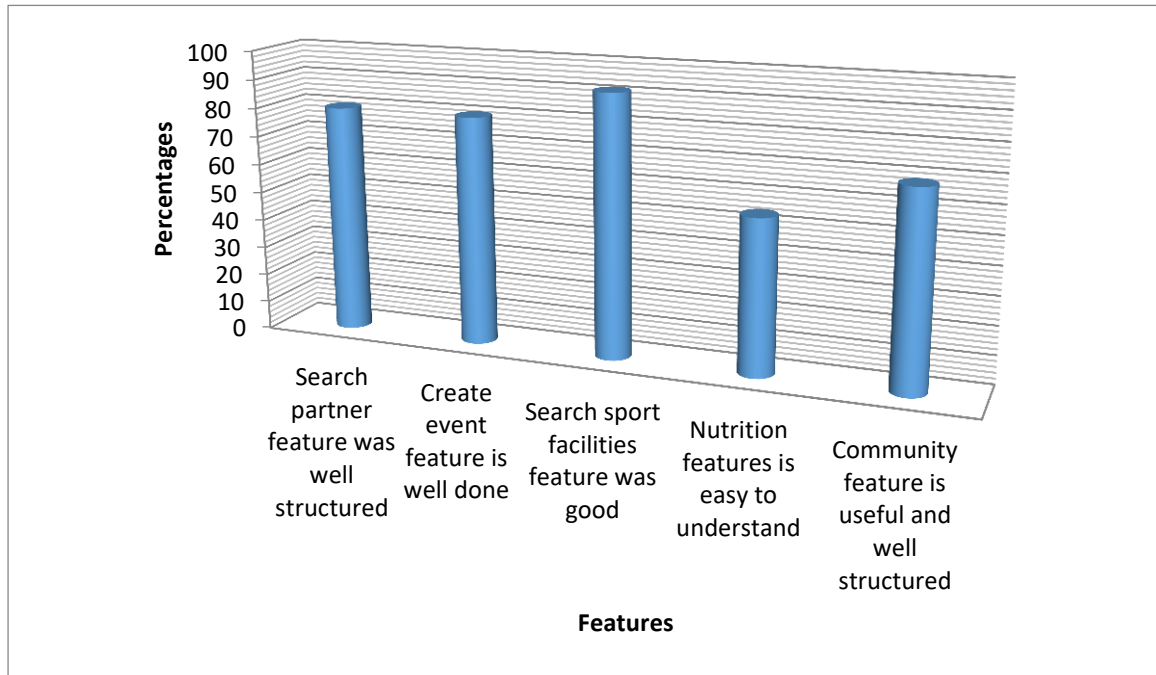


Figure 7.2: percentage score of different feature

Considering the user evaluation and score given in the table 7.5 and the Figure 7.2 , it is evident that *Search sports facilities* feature was the most important feature of the prototype. This feature got a score of 4.5 from the test users corresponding to approximately 90%. Following is “*Search partner*” feature and *Create event* feature with a score of 4 out 5 from each one and percentage of 80%. The *community* feature has a score of 3.4 on the scale of 5 . The lowest score was seen in the nutrition feature with only 2.7 out of 5 equivalent to 54%. Compared to other features users seemed to be less interested in this feature.

In the third part of this evaluation, there were open questions that participants had to answer by writing .Those questions were related to the overall feeling about the use of the product.This was evaluated on five scales that consist of 1=Definitely not 2=Probably not 3=Not sure 4=Probably 5=Definitely.

Four out of seven evaluated at a score of 4=probably that they will use of the product in the future. Two of them evaluated the prototype to a score of 5=definetely committed to the use of the product in the future. The lowest scale got on this evaluation question was 3=not sure on the use of the product in the future.

Overall, the results were satisfying, however, future research still needed for improvement .

8. RESULTS SUMMARY

This section summarizes briefly the whole thesis project, its limitation, ideas and suggestion for the future research contribution on this topic. The contribution brought is generally solution to add to other research work done in the past about the way to use technology to motivate overweight people to do physical activities. It is divided into two main parts, first the general description of the results and discussion and conclusion part.

8.1 General description of the results

The research done during this thesis had as objective to find the needs of overweight people that can push them to do physical exercise. Second, this thesis focused on designing prototype application that can address those needs and choose the suitable design strategies to use for the prototype.

In order to find the needs of overweight people that can help them to increase their level of physical activities 12 interviews were performed with different people. The results have shown that more than a half of interviewees confirmed that sociability could enhance their motivation toward physical activities. It was clear that an application that promoting companionship and social interaction between people could motivate users for physical exercises. As presented in the interviews results section 2.5 five factors were identified as motivational needs for physical exercises. These factors include companionship, scheduling or planning event, sports facilities, professional trainer and diet management. A social sports application prototype was designed with all the social features resulted from the user study.

The principal features of the prototype proposed consist of improving social network. With the social network feature, users can easily search for an exercise partner, team, community for desired sports activity, for example, searching for swimming team according to the purpose, sex, age and categories. This factor was revealed as one of the motivational factors for physical activity. Users could easily find support from friends, community during their physical exercises. In addition, they can plan and invite friends for a sports event. The feature for search sports facilities was proposed in order to address the need of sports facilities. The users can for example search for nearest or desired place for physical exercise at any location. Moreover, other features were developed in the social sports application, those include diet management feature to help in measuring his or her food calories, professional trainer to help users to get access to a professional coach. However, there are some aspects reviewed in existing application, section 2.5 of this thesis that was considered in the designing the social sport application. Those aspects include tracking, viewing, feedback and sharing information and record between friends about the exercises workouts, weight, and social network.

The design strategies used for the social sport application followed the Ahtinen (2015) model [12]. The strategies involve in four out of six dimensions of the model. This model was used because of its flexibility and it contains many design strategies for motivational sports applications. The table 8.1 shows the difference between features found in the existing applications and features developed in the social sport application prototype. It is evident that the social sport application prototype possesses more new features that promote the sociability. With the social application prototype, proposed users can socialize with other by finding an exercise partner, joining team and planning event and competition. Social sport application can also allow the users to localize where friends physical context. Users can also share information, post comment and discuss through group and forum. In the existing applications reviewed, there was no major way to search sports facilities, however, in the social sports application, users can search for example a swimming pool in their nearest environment. Other feature such as coaching, exercises activity and diet were reproduced in social sports application prototype as it was reviewed in the section 2.5 about motivational factors available in the currently used application.

FEATURES	EXISTING APPLICATIONS	PROPOSED FEATURES FOR THE NEW PROTOTYPE APP
Social network	<ul style="list-style-type: none"> • Add friend and share information, record, • Comment and message between friends, professional trainer, health care professional 	<ul style="list-style-type: none"> • Search for partner, team, community • Join a team or sport event • Plan events and competitions • Invite friends or a team for sport event • Share information, records, and testimony • Locate where friends are exercising
Sport facilities		<ul style="list-style-type: none"> • A search for nearest sport facilities or desired place for physical exercise
Coaching	<ul style="list-style-type: none"> • Vocal coach • Coaching from trainer, health care professional 	<ul style="list-style-type: none"> • .MyTrainer can help users to search for trainer, they can get even get in contact with them view their course training video etc.
Reward	<ul style="list-style-type: none"> • Given after achieving the goal on time 	Not available
Diet	<ul style="list-style-type: none"> • Food diary • Diet calendar and alert to remind user • Recommendation on food to take • Search for restaurant, food brand, and supermarket 	<ul style="list-style-type: none"> • Food diary • Diet calendar • Weight progress • Recommendation on food to take
Exercise activity	<ul style="list-style-type: none"> • Track, view and share the records • Selected desired activity • Route plan 	<ul style="list-style-type: none"> • Track, view and share the record • Select desired activity • Route plan

Table 8.1: List of features of existing application and proposed prototype application

8.2. DISCUSSION AND CONCLUSIONS

8.2.1 Summary of the Thesis

The objective of this thesis was to find a technological solution on how to motivate overweight people to do physical activities. In order to get to the objective of this thesis, design methods and some design tools were used. The User Centered Design was used as the main method during the whole process of the design. Tools such as Storyboardthat and Balsamiq were utilized in the design of the storyboard and prototype. This thesis started by collecting data on overweight people. A literature review of scientific articles, books, and other paper was done to get an overview of the past and current situation on the issues of overweight people. In addition, observation, interview helped to get to understand what was needed for overweight people to motivate them on doing physical activities by using a technological tool. Observation and interviews helped to get information on how overweight people do physical activity in their daily life. It is through both methods, interviews, and observation that it was possible to understand what their motivations are based on, what they like, how they usually do physical activities, who they like to be with, where they usually do physical exercises.

All the information collected from the target users were analyzed and interpreted through an affinity diagram. The results of the analysis were used in designing the prototype application. The results presented showed in table 8.1 the difference between the features found in the reviewed existing applications used to support people during their physical activities and the features proposed in the new social sport prototype application. Many of current applications were designed to support people for physical activities but some of these applications have features that can particularly increase the motivation of overweight people. The prototype application proposed as a solution has a combination of some of the features of the existing applications and some new added new features.

From the results found, it was clear that most of the participants needs are in different aspects. As motivational aspects, the participants highly valued the sociability. Social aspects as having community or partner to exercise with. Those needs and issues were addressed by the use of persuasive technology. In the prototype application proposed were designed with features that can facilitate the users to socialize. Through those social features, users can easily exchange information, arrange sports events and meetings between them or with their professional trainers etc. Furthermore, the prototype application gives the possibility of users to find exercise partner, team or community to exercises with. In short, the main ideas in the proposed the social sport application prototype resulted in features as:

- Search partner, team, community for desired sport activity
- Join a team or sport event
- Plan a game
- Invite friends or a team for sport event
- Share information, records, and testimony
- A search the nearest or desired place for physical exercise
- Coaching from trainer
- Diet calculator
- Track exercise

The motivational features designed in the prototype firstly address the essential human needs. Getting exercise partner, having a team, the sport facilities, are the basic needs that can support overweight people during physical exercises.

8.2.2 Methodological reflection and Limitation

During the whole research process, there were some factors that might have affected results as the data collected and the main factors taken into account in collecting the data. Collecting data is very crucial in order to find a solution to a specific problem. Finding the right solution implies to knowing the right problem. Gathering data was done through interviews with the potential users without taking into consideration of some factors such as cultural, gender, hobbies. Hence there are possibilities that the results found might have been biased and not be applied to the entire overweight population. This thesis has mainly focused on finding the solution for overweight people whose BMI is between 25 to 29.9. The age range consider was between 18 and 40 years old .However, people from different regions, different culture might have different perception on the issues related weight and to what can motivate them on doing physical exercises.

The interpretation of the data correlated the information found during the literature review and the interviews results. The majority of existing applications used to support people on their physical activities have a number of social features. The concept proposed also strongly focused on social aspects. The sociability can put people together in many ways including doing physical activities. A mockup prototype was developed to demonstrate different features and functionalities that can be used to motivate overweight people to increase the level of physical activities. Many applications had already been developed to support people during their physical activities. These applications have been designed for various purposes, some focus more on the physical exercises itself or on diet, others focus on one particular type of sports. The social sport application focuses on three aspects including sport, sociability and dietary.

Many of existing applications used during physical activities were designed to support people doing physical activity in a way or another. Those applications could also be used in the case of overweight people. There are some features found in existing applications that can be used to motivate overweight people in doing physical exercises. However, some overweight people might have some strong needs or desire of increasing motivation than other people. A friend or familiar community can boost the overweight people motivation for doing physical exercises than people who is already physically fit. Based on the results of interviews, it was proved that enhancing sociability could push overweight people to exercise more. The prototype application with more social features can strengthen the ties among friends and family members, it can even help to create a new relationship with other people.

In order to be more interesting for the users, the proposed social sport prototype application was designed with simplicity and familiarity. The prototype gives more freedom to users to select the desired physical exercises, desired partner or team according to the user's requirements. The features were included in the prototype solution mainly due to the users' wishes. The users showed that they desire features that can help them to create or maintain social ties between people. The user evaluation was performed to ensure that the prototype designed really match with the user's desire.

8.2.3 Conclusion and Future Work

From the last three decades, there was a raise of the issue of overweight people. Many different solutions have been used to tackle this challenge that the world faces today. Technology has been one of the solutions utilized to contribute to this issue. The main objective of this thesis was to find the needs of overweight people and find a technological solution to address those needs. A mobile application prototype was designed with different motivational features that help in boosting overweight people to do physical exercises. To choose a technological solution designed on a mobile device was due to the fact that the range of age of the target user which was between 18 to 40 years' old were good users of mobile devices as a phone, iPad, computer etc. All the participants interviewed admitted to mostly using different mobile application for communication and connect each other, for physical exercises etc. Considering the research done and the target of the thesis research, it can be concluded that the goal and objective were met.

The strength of the social sport application prototype designed is much more limited social aspects. The motivational features of the prototype have as aim to enhance the sociability between users in many ways. Doing physical exercises is a way of enjoyment, pleasure, and fun. The social features greatly contribute in increasing pleasure between people as they can easily communicate, gather and support each other.

The suggestion for the future research is to go far and make the high fidelity prototype by implementing those features. By testing the high fidelity prototype the users can give more qualitative feedbacks. Furthermore, the future research can consider more factors from the users, for example, cultural factor, gender, people physical fitness, weather, location etc. If more factors are taken into account during the research, the application can be approved by a big number of overweight people. For example, by considering the factor of gender, there could be features that can advise or coach the user during physical exercises according to gender and physical fitness.

User test was among the UCD phases carried out in order to find the level of usability of the prototype is for the overweight people, its effectiveness, and simplicity. The user evaluation was performed with the potential users, they had to interact with different features of the prototype and asked questions on how they feel using it. The small number of participants to the user study due to the short time scheduled for the thesis can have a negative impact on the outcome. For any future research, it is suggested to allow a huge number of participants from different backgrounds, and different social groups of people. Allowing a lot of time on the user study during the research surely provides good results. There is no specific number of people who can participate in the user study, however, the more people involve in it the more the results are accurate.

References

- [1] OBESITY AND OVERWEIGHT, DR P. PUSKA, NISHIDA, D. PORTER World Health Organization(WHO,2003). Available at:
http://www.who.int/dietphysicalactivity/media/en/gsfes_obesity.pdf
- [2] World Health Organization. (2015, January). Physical activity. Available at:
<http://www.who.int/mediacentre/factsheets/fs385/en/>
- [3] American Heart Association 2013, Available at
http://www.heart.org/idc/groups/heart-public/@wcm/@sop/@smd/documents/downloadable/ucm_319588.pdf
- [4] Popul Health Metr 2012, National, regional, and global trends in adult overweight and obesity prevalences, Available at: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3543235/>
- [5] WHO 2015, Obesity and overweight Available at
http://www.who.int/gho/ncd/risk_factors/overweight_text/en/
- [6] The Lancet May 2014, Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013 Available at: <http://math.stanford.edu/~maksymr/paper.pdf> ,Page 2
- [7] Global recommendations on physical activity for health, WHO2010,
http://apps.who.int/iris/bitstream/10665/44399/1/9789241599979_eng.pdf
- [8] World Health Organization (September 2015), European ministers of health adopt strategy to tackle physical inactivity in 53 WHO Member States Available at
<http://www.euro.who.int/en/media-centre/sections/press-releases/2015/09/european-ministers-of-health-adopt-strategy-to-tackle-physical-inactivity-in-53-who-member-states>
- [9] Talking with Patients about Weight Loss: Tips for Primary Care Providers National Institutes of Health (NIH2012)
<http://www.niddk.nih.gov/health-information/health-topics/weight-control/talking-with-patients-about-weight-loss-tips-for-primary-care/Documents/TalkingWPAWL.pdf>
- [10] Measurement of motivation exercises, Donna J. Plonczynski 2000, available at
<http://her.oxfordjournals.org/content/15/6/695.full.pdf+html>
- [11] How to Measure Motivation: A Guide for the Experimental Social Psychologist, Maferima Touré-Tillery and Ayelet Fishbach 2014 available at
<http://faculty.chicagobooth.edu/ayelet.fishbach/research/SPCOTilleryFishbach.pdf>
- [12] Ahtinen, A. 2015. Mobile Applications to Support Physical Exercise-Motivational Factors and Design Strategies.Tampere University of Technology

- [13] Sunny Consolvo, Predrag Klasnja, David W. McDonald, & James A. Landay, Goal-Setting Considerations for Persuasive Technologies that Encourage Physical Activity, Available at <https://dub.washington.edu/djangosite/media/papers/Persuasive09-consolvoEtAl.pdf>
- [14] Fogg, B. (2003). Using Computers to Change What We Think and Do. Dans B. Fogg, Persuasive Technology. Morgan Kaufmann
- [15] Design Requirements for Technologies that Encourage Physical Activity, (Sunny Consolvo¹, 2, Katherine Everitt³, Ian Smith¹, & James A. Landay 2006)
<http://www.cs.helsinki.fi/u/thusu/opinnot/uschool/T-121.5500/p457-consolvo.pdf>
- [16] Abras, C., Maloney-Krichmar, D., Preece, J. (2004). User-Centered Design. In Bainbridge, W. Encyclopedia of Human-Computer Interaction. Thousand Oaks: Sage Publications available at <http://www.e-learning.co.il/home/pdf/4.pdf>
- [17] ISO 13407:1999 Human-Centered design processes for interactive systems. Tech. rep., International Organization for Standardization, Switzerland, 1999.
- [18] ISO DIS 9241-210. Ergonomics of human system interaction - part 210: Human-centred design for interactive systems. Tech. rep., International Organization for Standardization, Switzerland, 2010.
- [19] B. v. Niman, T. Sund, A. Rodriguez-Ascaso, S. Brown and P. Garner, User Experience Design Guidelines for Telecare Services, Proceedings of the 8th conference on Human-computer interaction with mobile devices and services, ACM, 2006, pp. 279-280
- [20] Yoganathan, D. & Kajanan, S. 2013. Persuasive Technology for Smartphone Fitness Apps, In Proceedings of the 17th Pacific Asia Conference on Information Systems.
- [21] Sunny Consolvo, Katherine Everitt , Ian Smith¹ , & James A. Landay 2006. Design Requirements for Technologies that Encourage Physical Activity
- [22] Patrick C. Shih, Kyungsik Han, Erika Shehan Poole, Mary Beth Rosson, John M. Carroll 2015. Use and Adoption Challenges of Wearable Activity Trackers
- [23] Berkman, L., Glass, T., Brissette, I., & Seeman, T. E. (2000). From social integration to health: Durkheim in the new millennium. Social Science & Medicine, 51(6), 843-857
- [24] Sherwood, N. E., & Jeffery, R. W. (2000). The behavioral determinants of exercise: implications for physical activity interventions.

APPENDIX A: Interview Questions

Profile

Name:

Occupation:

Age:

Gender:

Weight:

Height:

Physical activity

- How important do you consider physical activity is for health?
- How regular do you practice exercises? How long (in minutes) do you spend in each exercise session?
- What motivates you to keep up with your physical activity routine?
- What are the things that make you slip out from your routine?
- How do you reach the motivation again?
- Are you happy with your body shape and worry about gaining weight?
- Do you have any fitness goals for yourself? If so, what are they?
- Do you take into account doing physical exercises to lose weight? If yes, what exercises do you do?
- What could opinion be in getting a professional such a healthcare provider to guide, advise you by following your physical exercises performance?
- What are your thoughts with regard to becoming more physically active if you think about the future?
- Do your work involves in any physical activity? if yes, How?

Dietary

- Do you somehow evaluate you eating habit? How?
- Do you measure/estimate the amount of calories you take every day? How?
- Has your diet caused a health problem in the past? How?
- Do you have regular times of eating every day?
- According to your experience, what are the main reasons for slipping out of the healthy eating routine?
- What is your opinion about a healthcare professional to advise your diet or support your healthy eating routine? Who would be suitable professional?

Application /electronic devices

- What electronic device do you use the most?
- Do you use the device in monitoring your physical activity? If yes, how?
- From when did you start using the current device/application if any?
- How good or bad is the device/application you currently use?
- How do you think that your current device/app can be improved?
- What kind of features would keep up your interest in physical exercise?
- How many devices/application have you used in the past to monitor your physical exercises?
Which devices/applications have you used?
- Why don't you use them anymore?
- Thinking about your daily life, would you say that your electronic devices/application increases or decreases your physical activity? Please explain your opinion?

APPENDIX B: Form of Consent

Informed Consent Form for a Thesis Research project for Master Degree Programme

University: Tampere University of Technology(TUT)

Programme: Information Technology

Major: User Experience

Project Title: DESIGNING INTERACTIVE TECHNOLOGY TO MOTIVATE OVERWEIGHT PEOPLE TO LOSE WEIGHT BY DOING PHYSICAL ACTIVITY

Interviewer name:

Thank you for your interest in accepting to participate in this this research.

If you have any questions from the description and explanation, you already have been given about the subject, you can ask them, you are given a copy of this consent form as your agreement reference.

Participant's Statement

I volunteer to participate in a research project conducted by Itangishaka Alain Victor from Tampere University of Technology. I understand that the project is designed to gather information about an Interactive design technology to motivate overweight people to lose weight by doing physical activity I agree that:

- I have read the notes written above, the oral Information and explanation given to me, and understand what the research involves in.
- I understand that I can stop continuing to participate at this interview at any time during the interview and can notify the withdrawal.
- I consent to the processing the personal information that I will give for only the purposes of this research study.
- I understand that my personal information will be treated with confidentiality. Subsequent uses of records and data will be subject to standard data use policies which protect the anonymity of individuals and institutions
- I agree that the Itangishaka Alain Victor has explained me and satisfied with the information given and I decide to take part in this study.

Interviewer name:

Interviewee name

Date and signature

Date and signature

APPENDIX C: User satisfaction questionnaire

	Very unsatisfied=1	Unsatisfied=2	Neutral=3	Satisfied=4	Very Satisfied=5
	1	2	3	4	5
The content of the application were important	()	()	()	()	()
I had difficulty to understand the concept	()	()	()	()	()
The appearance was nice	()	()	()	()	()
The home menu easy to understand	()	()	()	()	()
Navigating from one feature to another is easy	()	()	()	()	()
Search partner feature was well structured	()	()	()	()	()
Create sport event feature is well done	()	()	()	()	()
Search for sport facilities (place for sport) was easy	()	()	()	()	()
Nutrition features is easy to understand	()	()	()	()	()
Easy to calculate his/her calorie intake	()	()	()	()	()
Easy to plan his food	()	()	()	()	()
Overall, how satisfied were you	()	()	()	()	()
It was easy to check his/her weight progress	()	()	()	()	()
My community feature is useful and well structure	()	()	()	()	()
The use of this prototype application is simple	()	()	()	()	()

What aspect of the product / service were you most satisfied by?

- 1.
- 2.
- 3.

What aspect of the product / service were you most disappointed by?

- 1.
- 2.
- 3.

What do you like about this prototype app?

What do you dislike about this prototype app?

Would you use our product / service in the future?

Definitely () probably () Not sure () Probably not () Definitely not ()

What is your overall personal opinion about the prototype application?